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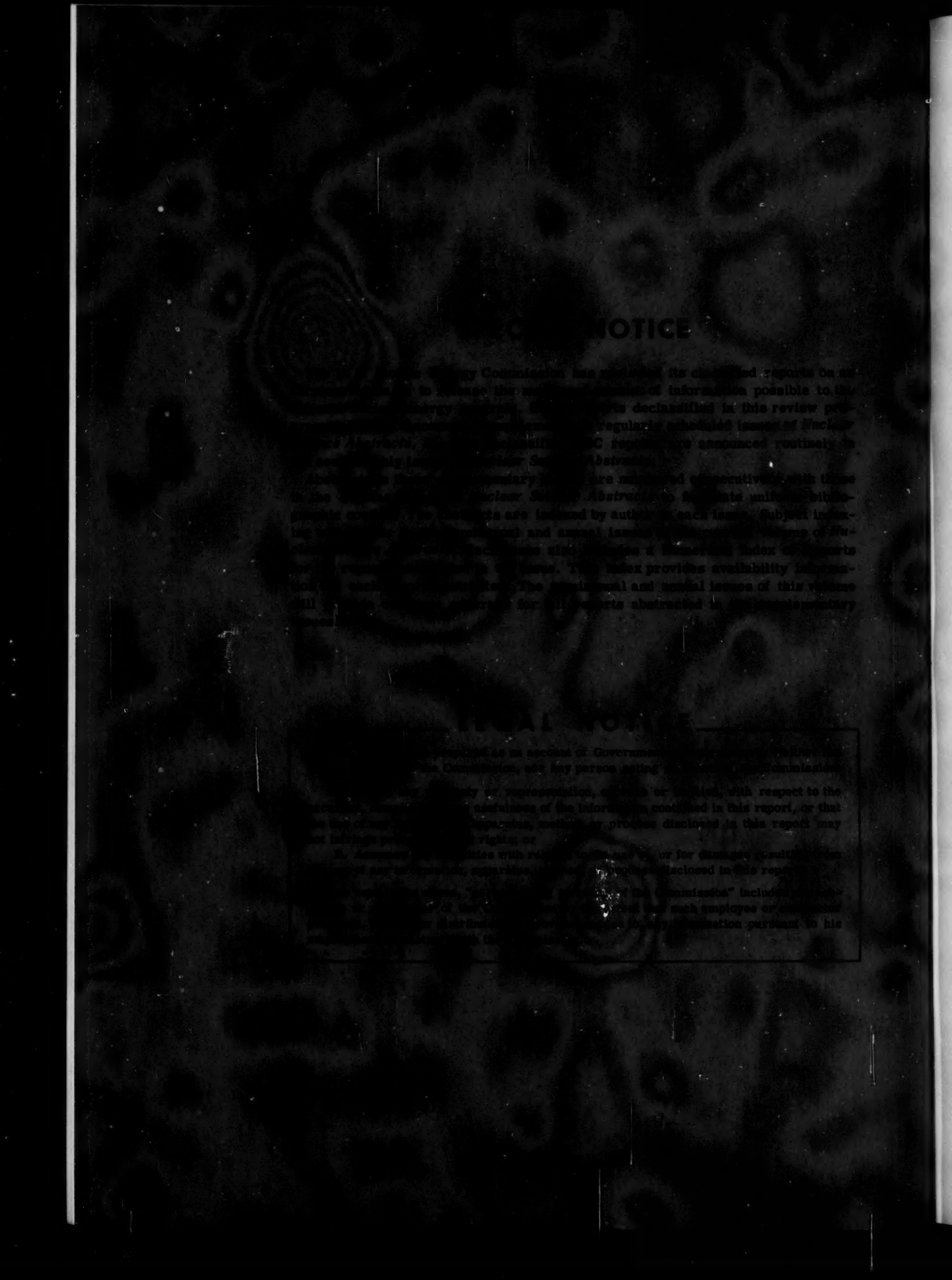

NUCLEAR SCIENCE ABSTRACTS

Volume 11 February 28, 1957 No. 4 Suppl.

GENERAL

ATOMIC POWER

2231 CF-51-7-66
Oak Ridge National Lab., Tenn.
A PRELIMINARY STEAM POWER CYCLE STUDY FOR REACTORS. L. S. Mims. July 16, 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Considerations of space and economy in the design of a reactor power plant where the operating temperature of the reactor is below the critical temperature of water, 705°F, make the use of primary coolant to superheat steam undesirable because of a large coolant holdup. The present paper shows that a steam reheat cycle, which uses saturated steam at the throttle, not only has the advantage of smaller coolant holdup, but also yields a higher thermal efficiency, for a given throttle temperature, than does the superheated regenerative cycle. (auth)

2232 ORNL-1387
Oak Ridge National Lab., Tenn.
COST ESTIMATES FOR SEVEN 200 MW TURBINE PLANTS FOR OPERATION WITH NUCLEAR REACTORS AT VARIOUS STEAM CONDITIONS. J. D. Maloney, Jr. Jan. 22, 1953. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 41p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00 (mf OTS).

BIOLOGY AND MEDICINE

2233 UCLA-307
California. Univ., Los Angeles. Atomic Energy Project.
QUARTERLY PROGRESS REPORT FOR THE PERIOD ENDING SEPTEMBER 30, 1954. Oct. 1, 1954. Decl. Mar. 20, 1956. 121p. Contract AT-04-1-gen-12. $18.30(ph OTS): $6.00(mf OTS).

RADIATION EFFECTS

2234 HW-35663
Hanford Atomic Products Operation, Richland, Wash.
PROPOSED REVISION IN COMPUTATIONS OF MPC'S FOR LONG-LIVED RADIOISOTOPES. J. W. Healy. Mar. 1, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 10p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The computational techniques and basic concepts for finding the MPC's of Pu, Ra, U, and Sr longlived isotopes are illustrated. It is assumed that the excretion of retention follows a power law rather than an exponential law. (F.S.)

2235 LA-1092
Los Alamos Scientific Lab., N. Mex.
HEMATOLOGICAL CHANGES IN HUMANS CHRONICALLY EXPOSED TO LOW-LEVEL GAMMA RADIATION. Robert E. Carter and Norman P. Knowlton, Jr. Mar. 27, 1950. Changed from OFFICIAL USE ONLY July 18, 1956. 14p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

At the Los Alamos Scientific Laboratory, a number of individuals are exposed continually to small amounts of ionizing radiation. Although it is well known that small doses of whole-body radiation (0.1 to 10 r) in single acute exposures cause no change in the peripheral blood picture, it is possible that if a large enough group of individuals, chronically exposed to low-level gamma radiation, is studied over a long enough period of time, statistically significant hematological changes might be observed. Ten individuals at the Los Alamos Scientific Laboratory were considered satisfactory for such a study, both from the point of view of the duration and average level of their exposures, and because of the complete records available in each case. This paper reports the analysis of the blood counts done on these ten men, together with suitable control cases, over a three-year period from December 12, 1946 through December 11, 1949. This time interval has been divided into four consecutive nine-month periods. (auth)

2236 LA-1440
Los Alamos Scientific Lab., N. Mex.
FURTHER STUDY OF HEMATOLOGICAL CHANGES IN HUMANS CHRONICALLY EXPOSED TO LOW LEVEL GAMMA RADIATION. Robert E. Carter, Frederick C. V. Worman, Phyllis Sanders, and Verda Strang. July 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 20p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

The apparent hematological changes in 10 individuals, exposed to total-body γ radiation in near tolerance amounts, over a period of four and one-half years are summarized. Two control groups, in addition to the exposed group, were used for comparative purposes. Control group I received essentially no γ or β radiation. Control group II received exposures at least a factor of 10 below those of the exposed group. The average total leukocyte count, absolute neutrophil value, and absolute lymphocyte value, were determined for each individual and for all groups. Analysis of data indicates a significant depression of the absolute lymphocyte value of the exposed group as compared with those of the control groups. (auth)

2237 UCLA-320
California. Univ., Los Angeles. Atomic Energy Project.
QUARTERLY PROGRESS REPORT FOR PERIOD ENDING DECEMBER 31, 1954. Dec. 1, 1954. Decl. Mar. 20, 1956. 124p. Contract AT-04-1-GEN-12. $19.80(ph OTS); $6.30(mf OTS).

Progress is reported in studies of the effects of x irradiation upon fat absorption in rats; the isolation and study of nucleic acids from a number of sources; the synthesis of 9, 10, 12-tribromostearic acid and 9, 10, 12, 13, 15, 16-hexabromostearate; the effects of x irradiation on the rate of edema formation and excretion of histamine in rats; effects of γ irradiation on Mg content of blood plasma of burros; the protective effect of reticulo-endothelial system stimulation on the mortality of rabbits exposed to whole-body x irradiation; the development of tests to measure phagocytic function of the reticulo-endothelial system as demonstrated by the liver uptake and blood clearance of I^{131}-labeled injected E. Coli and the blood clearance of

Cr^{51}-tagged heterologous erythrocytes; data on the amounts of natural, nonradioactive Sr in the daily average intake of food and water by humans and data on Sr present in human bones suggest an average body burden of 0.6 gm of stable Sr and a maximum allowable intake of 1.5×10^{-3} μc of Sr^{90} per day; the mechanism of the oxidation of ammonia by hypobromite and the formation of a second table intermediate in the oxidation sequence; the relation of acid production, peroxide production, and exhaustion of the medium to the observed antimicrobial activity of cultures of lactobacilli; ultracentrifuge studies on plasma lipoproteins of chicken embryos; the effects of radiation on the solubility of Cu, Ag, H_3PO_4, and other metals in saturated water; preliminary experimental work on the design and fabrication of instruments for use during the Nevada tests; routine radiation monitoring procedures; the metabolism of fission products by plants and animals; the biological accumulation and persistence of radioactive fall-out; the physiological effects of air blast in rats; and factors affecting the sensitivity of colorimetric radiation dosimeters. (For preceding period see UCLA-307.) (C.H.)

RADIATION HAZARDS AND PROTECTION

2238 AECD-3753
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
MAXIMUM ALLOWABLE CONCENTRATION FOR AIRBORNE BETA CONTAMINATION. J. C. Bailey and H. F. Henry. July 5, 1951. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 16p. Contract [W-7405-eng-26]. (KS-213). $3.30(ph OTS); $2.40(mf OTS).

By comparing the damage produced by β particles and uranium α particles emitted by material uniformly distributed in the lungs, an equation was derived by which the maximum allowable concentration in the atmosphere of a β-emitting isotope for which lung damage is the limiting consideration can be calculated. It was calculated that for such isotopes a conservative value for the maximum allowable concentration is 20 counts per minute per ft^3 as measured by the counter presently in use at K-25 for air sample β counting. The equation for calculating the maximum allowable concentration for beta emitters which are retained in the body and for which lung damage is not the limiting consideration is given. As examples of the use of this equation, maximum allowable air-borne concentrations as determined by retention in the body were calculated for Sr^{89}, Sr^{90}, and UX_1. An equation for the maximum allowable concentration of an isotope for which body retention is the limiting factor, in combination with isotopes for which lung damage is the limiting factor was derived. A curve is given which shows the maximum allowable counting rate for Sr^{90} in combination with other beta emitters having an average energy of 0.4 Mev, as a function of the fraction of the disintegrations due to Sr^{90}. (auth)

2239 CF-54-6-27
Oak Ridge National Lab., Tenn.
RELATIVE BIOLOGICAL HAZARDS ASSOCIATED WITH RADIATIONS EXPECTED IN HOMOGENEOUS REACTORS K-23 AND K-49. E. D. Arnold and A. T. Gresky. June 7, 1954. Decl. Dec. 21, 1955. 34p. Contract W-7405-eng-26. $0.30(OTS).

The relative biological hazards of the various significant isotopes produced in K-23 and K-49 were obtained as functions of their maximum permissible concentrations in air, relative biological effectiveness in critical body organs, expected production rates, and decay. Conditions involving systems at biological equilibrium and an average 80-day reactor operating cycle were considered. Summation of these relative biological hazards in relation to the reported critical body organs permitted a qualitative analysis of the relative importance of critical organs in given cases, which may have significance in protection of personnel. (auth)

2240 HW-15743
Hanford Works, Richland, Wash.
ANALYSIS OF VEGETATION FOR I^{131}. M. B. Leboeuf. Jan. 27, 1950. Changed from OFFICIAL USE ONLY Aug. 31, 1956. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

An analytical procedure in which the I_2 is extracted from the vegetation by the use of a caustic solution is described. A limiting sensitivity of 0.002 to 0.004 μc/kg results when a 5g sample is analyzed. (auth)

2241 HW-23352(Rev.)
Hanford Works, Richland, Wash.
STUDY OF ATMOSPHERIC CONTAMINATION IN THE MELT PLANT BUILDING. F. E. Adley, W. E. Gill, and R. H. Scott. Apr. 4, 1952. Decl. Dec. 1, 1955. 94p. Contract W-31-109-eng-52. $0.50(OTS).

A preliminary survey of operations in the Melt Plant Building indicated that virtually all production activities were potential contributors to atmospheric contamination by uranium oxide fume and dust. The dust is disseminated in the air when dislodged from oxidized surfaces of uranium or during oxide-handling operations; fume arises when small pieces of uranium metal are allowed to burn. Oxide-handling, machining operations, burnout, and rod-handling were the chief contributors to atmospheric dust and fume. For personnel in the remelt processes, the weighted daily exposures they experienced varied from 40 to 78 times the weighted daily MPC level. Weighted daily exposures at rod-handling showed an exposure 2 1/2 times the MPC. Studies of particle distribution showed that 90% by weight of airborne particles are of respirable size (less than 10 μ in diameter). Particles less than 5 μ in diameter remain suspended in the air for long periods, resulting in continuous above-tolerance concentrations. Particles that do settle out are disturbed by plant traffic, vibration, and air turbulence and are thus redistributed in the atmosphere. Ventilation is more effective in the furnace room than elsewhere. Ventilators in the burnout room, in the oxide furnace, and at the rod straightener provide incomplete control. Fume and dust arising from some machining operations and from some oxide-handling procedures are without benefit of satisfactory control. Cross-contamination of the atmospheres at some processes and at nonproduction areas occurs by reason of the general ventilation that intermixes the atmospheres of the various plant areas. The wearing of respirators is required, but experience in other industries has shown that the degree of protection is uncertain. Discomfort and the imperfect fit of them to facial contours are contributing factors. Reliance on respirators as a primary control measure is not, therefore, a recommended practice. In view of these findings, recommendations are presented for improved general ventilation, for extending the application of local exhaust to all of the principal dust- and fume-producing operations, and for meticulous housekeeping through widespread use of vacuum-cleaning. (B.J.H.)

2242 HW-36301(Del.)
Hanford Atomic Products Operation, Richland, Wash.
RADIOLOGICAL SCIENCES DEPARTMENT RESEARCH AND DEVELOPMENT ACTIVITIES QUARTERLY PROGRESS REPORT [FOR] JANUARY–MARCH 1955. H. M. Parker. Apr. 10, 1955. Decl. with deletions Dec. 7, 1955. 28p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Progress is reported in the radiobiological-ecological survey of the Columbia River; the toxicity of I^{131} in sheep; and the response of the skin of swine to continuous exposure to particles of Ru^{106}. The subcutaneous injection to the lateral neck region of 3 to 4.5 mg of curare with hyaluronidase while the animal is busy eating was found to be an effective procedure for the immobilization of 70-kg swine. Preliminary data are presented from studies on Pu absorption and metabolism in rats; fission product metabolism in rats; the tissue distribution of P^{32} in rats when fed incorporated in flesh or plant tissue; pathological effects following the intratracheal administration of $Ru^{106}O_2$ particles to mice; the uptake of Sr^{90} and Ba^{140} by plants; a comparison of the relative biological effectiveness of β particles from S^{35} and from tritium on haploid and diploid yeast; the radiobiological monitoring of rodents and waterfowl collected in the area; the development of methods for the ion exchange separation of radiochemically pure Na^{24} from reactor cooling water and Cs^{137} from aged fission products; the determination of P^{32} in reactor cooling water; and the determination of thorium following separation from urine; an investigation of shielding materials for use during body monitoring; the development of methods for the control of atmospheric pollution from stacks; and the development of instruments for monitoring the environment and waste disposal systems. (C.H.)

2243 KAPL-492

Knolls Atomic Power Lab., Schenectady, N. Y., and General Electric Co. Research Lab., Schenectady, N. Y.
DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS DIVISION. Semiannual Progress Report for the Period Ending December 31, 1950. R. Z. Bouton, R. W. Houston, and W. Van der Grinten. Jan. 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 72p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

Progress is reported in developmental activities during the period. A modified electrostatic precipitator was developed which utilizes a point-to-plane electrode configuration which deposits the entire aerosol on a half-inch diameter surface which may be removed quantitatively in a transparent plastic film for chemical analysis or microscopic size count. Preliminary results were obtained on size distribution of KAPL shop dusts. Progress is also reported on the development of a nuclear counting technique for the determination of tritium as HTO in urine or other aqueous samples, an investigation of the fluorimetric method for the determination of Be, and a nuclear film procedure for the determination of very low levels of α activity. (C.H.)

Refer also to abstract 2599.

TOXICOLOGY STUDIES

2244 CH-3589

[California. Univ., Berkeley. Radiation Lab.]
A COMPARISON OF THE METABOLISM OF PLUTONIUM (Pu^{238}) IN MAN AND THE RAT. J. Crowley, H. Lanz, K. Scott, and J. G. Hamilton. May 31, 1946. Changed from OFFICIAL USE ONLY Nov. 13, 1956. 17p. Contract W-7405-eng-48-A. $3.30(ph OTS); $2.40(mf OTS).

The fate of Pu injected intravenously into a human subject and into rats was followed in parallel studies. The distribution of Pu among the tissues of the body and the average daily rate of excretion of this element are compared in man and in rats. In general, the results of these experiments show a high degree of prolonged retention of Pu in the body, with selective deposition in the skeleton, especially in the region adjacent to the bone marrow in the endosteum and trabecular bone. The elimination of Pu from the body occurs at higher rates in rats than in man. During the course of these studies, rats eliminated 50% of the Pu administered, whereas in the parallel experiment in man, only about 5% was excreted. The elimination of Pu is primarily via the feces in rats, whereas in man the major elimination of Pu occurs via the urine. (auth)

2245 MLM-471-1

Mound Lab., Miamisburg, Ohio.
BIOLOGICAL RESEARCH QUARTERLY REPORT [FOR] APRIL, MAY, [AND] JUNE 1950. July 1, 1950. Decl. Jan. 10, 1956. 95p. Contract AT-33-1-Gen-53. $10.80 (ph OTS); $3.90(mf OTS).

Studies are reported on the distribution of Po in the different tissues, fluids, and excretory products of laboratory animals; effects of Po on cell metabolism; hematological and pathological effects of Po on rats, rabbits, cats, and dogs. (F.S.)

WASTE DISPOSAL

2246 CF-48-1-175

[Oak Ridge National Lab., Tenn.]
WATER ACTIVITY COMPUTATIONS. T. H. J. Burnett. Jan. 14, 1948. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The method used in calculating the activity released to the Clinch River from Oak Ridge installations is presented and discussed. (D.E.B.)

CHEMISTRY

2247 AECD-3742

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
ZIRCONIUM-PRECIPITATION PILOT PLANT. G. T. Parish, R. Bakal, E. I. Goodman, and H. A. Larsen. Sept. 30, 1950. Changed from OFFICIAL USE ONLY June 28, 1956. 16p. (KT-86). $3.30(ph OTS); $2.40(mf OTS).

The method used precipitates the zirconium as zirconyl phthalate which is, in turn, converted to zirconium hydroxide by leaching with concentrated ammonium hydroxide. The hydroxide is filtered, and the phthalate may be recovered in the filtrate and recycled. The chemical laboratory investigations show that as much as 80% of the phthalic acid may be recovered in the filterate and reused. The object of this investigation is twofold: first, to improve the design of an existing pilot plant to allow better control of operating variables than was attained by previous investigators, and second, to determine the effect of leaching time on phthalate recovery. (auth)

2248 AECU-3247

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
THE FLUIDIZED CONDENSER (thesis). Curt B. Beck, Thomas D. Canby, and Irwin S. Zonis. May 10, 1952. 80p. For Carbide and Carbon Chemicals Div., [K-25 Plant. Contract W-7405-eng-26, Subcontract 70]. (KT-123). $0.45(OTS).

Submitted as a thesis to Massachusetts Inst. of Tech.

An apparatus using a fluidized bed of cold, recycled $ZrCl_4$ powder to condense a stream of hot $ZrCl_4$ vapor was designed and constructed. The operation of the fluidized condenser was successfully demonstrated. It was shown that caking of $ZrCl_4$ on the walls of the column was slight, with the greatest part of the condensation occurring in the

fluidized phase. Because of time limitations, few runs were made. Data from future experimental runs on the fluidized condenser may be used in a proposed theoretical analysis, in which several equations have been developed to allow the design of a fluidized condenser for given operating conditions. These equations predict optimum column size for the desired degree of condensation, axial temperature gradient in the bed, and over-all heat-transfer and mass-transfer coefficients. (auth)

2249 AECU-3308

[Sandia Corp., Albuquerque, N. Mex.]
MEASURING THE MOISTURE CONTENT OF AIR. Milton W. Davis. May 28, 1954. 8p. (TM-95-54-51). $1.80 (ph OTS); $1.80(mf OTS).

The relation between dew point and mixture pressure is derived for the case where no condensation is present. A LiCl-type dew point recorder is described. (auth)

2250 HW-35579

[Hanford Atomic Products Operation, Richland, Wash.]
THE RELATION OF FLASH POINT TO VAPOR PRESSURE. L. L. Burger. Feb. 24, 1955. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The flash points (TCC) of hydrocarbons occur at temperatures corresponding to vapor pressures of from 4 to 10 mm Hg. High molecular weight paraffins flash at a lower vapor pressure than do the smaller molecules, i.e., the concentration required is lower at the higher temperatures involved. The vapor pressure and thus the flash point of a mixture is largely determined by the lower molecular weight compounds present; for kerosene-type materials the flash point is reached when the vapor pressure becomes about 8 mm Hg. (auth)

2251 KAPL-557

Knolls Atomic Power Lab., Schenectady, N. Y.
SUMMARY REPORT OF REACTION TESTS OF VARIOUS MATERIALS TESTED WITH SODIUM AND SODIUM–POTASSIUM. C. O. Nelson. June 1, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 51p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

Tabular data show the methods, conditions, and observations of tests carried out in air to determine the reactions of liquid Na and NaK with Al roofing, cloth (including protective clothing), laboratory equipment, fire-extinguishing materials, insulating and packing materials, oils, paints, brass and Cu screens, and Li fire-extinguishing materials. (F.S.)

2252 LAMS-665

Los Alamos Scientific Lab., N. Mex.
METHYL METHACRYLATE CASTING RESIN. J. S. Church and H. R. Tyler. Jan. 8, 1948. Changed from OFFICIAL USE ONLY Feb. 18, 1956. 22p. $4.80(ph OTS); $2.70(mf OTS).

Improvements in the casting characteristics of methyl methacrylate resin are described. The experimental program was initiated with the objectives of decreasing casting time, bubble formation and shrinkage. It has been found that by use of a common solvent for monomer and polymer, a polymer concentration in monomer can be attained greater than any previously reported in preparation of a methacrylate casting resin. Incorporation of this greater amount of polymer has produced the desired effects. A bibliography of relevant literature is included to which reference is made in the text. (auth)

2253 NAA-SR-197

North American Aviation, Inc., Downey, Calif.
CHEMICAL REACTION BETWEEN WATER AND RAPIDLY HEATED METALS. W. C. Ruebsamen, F. J. Shon, and J. B. Chrisney. Oct. 27, 1952. Decl. Dec. 5, 1955. 30p. Contract AT-11-1-GEN-8. $4.80(ph OTS); $2.70(mf OTS).

To explore conditions under which explosive chemical reactions occur with water, wire and foil samples of metals used in nuclear reactors were heated while immersed in water in a pressure vessel. Heating was accomplished by high voltage condenser discharge. The extent of chemical reaction was calculated from measurements of the amount of hydrogen gas formed and the weight of metal lost. Reaction time was estimated from oscillograph measurements to be of the order of 100 microseconds. Substantial amounts, up to 100 per cent, of the following metals and alloys were found to react: U, Zr, Al, Al-Li alloy and Al-U alloy. No outstanding differences in reactivity were observed among this group. Under identical experimental conditions, Ni did not react appreciably. It appears in these experiments that explosive chemical reaction with H_2O occurred (in thermodynamically favorable cases) when the temperature rise in the metal was sufficiently rapid to cause dispersion of the metal into a finely divided state. Only rough estimates could be made of the maximum temperature attained by the wire samples and of the threshold energy density for reaction. A discussion is presented of possible extensions of the experimental work, including heat-transfer measurements. (auth)

2254 UCRL-1196

California. Univ., Berkeley. Radiation Lab.
CHEMISTRY DIVISION QUARTERLY REPORT [FOR] DECEMBER 1950, JANUARY AND FEBRUARY 1951. Apr. 4, 1951. Decl. Jan. 12, 1956. 57p. Contract W-7405-eng-48. $9.30(ph OTS); $3.60(mf OTS).

AEROSOLS

2255 HW-35043

[Hanford Atomic Products Operation, Richland, Wash.]
PENETRATION OF RESPIRATORY PROTECTIVE EQUIPMENT BY RUTHENIUM AT BUILDING 202-S. W. E. Gill. Feb. 21, 1955. Decl. Feb. 2, 1956. 22p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

The four types of respirator cartridges used at the 202 S Building were tested against aerosols found at that location, and in the laboratory against non-radioactive gaseous ruthenium tetroxide. Positive penetration of two types of cartridges was shown with one process aerosol. Gaseous ruthenium tetroxide penetrated all types of cartridges tested. Leaks were found in some of the cartridges. Particle size of aerosol particles was measured by means of cascade impactor samples and electron photomicrographs. A high percentage of the aerosol particles was found to be less than 0.2 microns in diameter. Ru^{103} + Ru^{106} and Zr^{95} + Nb^{95} were shown to be present in the process aerosol by gamma ray spectrometer analysis. Possible causes of penetration of respiratory equipment by ruthenium are discussed and suggestions made for alleviating the problem. (auth)

ANALYTICAL PROCEDURES

2256 A-3626

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
QUANTITATIVE ELECTROPLATING OF URANIUM FOR ISOTOPIC ANALYSIS USING NICKEL AND MONEL AS BASE METALS. Clayton McAuliffe. Feb. 27, 1946. Changed from OFFICIAL USE ONLY Nov. 28, 1956. Includes Supplement No. 1 by J. A. Klacsmann and J. S. Fox. Apr. 1, 1946. 96p. Contract [W-7405-eng-26]. $15.30 (ph OTS); $5.40(mf OTS).

2257 A-3648(Del.)
Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
A SPECTROGRAPHIC METHOD FOR THE DETERMINATION OF MOLYBDENUM IN UF_6. E. H. Leslie and S. J. Kiehl, Jr. Mar. 1, 1946. Decl. with deletions Nov. 29, 1955. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A spectrographic method for the determination of Mo in UF_6 and other U compounds has been developed. It's range covers from 0.1 to 20 ppm of Mo from UF_6, using Cu_2S as a carrier, conversion of the Cu_2S to CuO, and burning of the CuO in a ten-ampere d-c arc. (W.L.H.)

2258 CC-1379
General Electric Co., Pittsfield, Mass.
STUDIES ON THE DETERMINATION OF CARBON BY THE LOW PRESSURE COMBUSTION METHOD. W. M. Murray, Jr. and S. E. Q. Ashley. Oct. 20, 1943. Decl. June 26, 1956. 30p. (A-2020). $4.80(ph OTS); $2.70 (mf OTS).

The apparatus for the low pressure combustion method of determining C in Fe and steel has been redesigned to increase the speed of manipulation. It has been tested by running several thousand determinations and found to yield results in good agreement with Wooten's form of the apparatus. A detailed description of the equipment and its manipulation is given together with an account of experimental studies on the method. Results are also shown for the C content of Cu. (auth)

2259 CC-2752
[Massachusetts Inst. of Tech., Cambridge.]
THE SPECTROGRAPHIC DETECTION OF FLUORINE AND OXYGEN. G. R. Harrison, J. Rand McNally, Jr., and Eugene Rome. Jan. 20, 1945. Decl. Dec. 15, 1955. 34p. Contract W-7405-eng-175. $6.30(ph OTS).

Spectrographic methods of quantitative analysis suitable for determining low concentrations of F and O_2 were developed. Using the hot spark it was found possible to detect 300 ppm in the vacuum region. Using the hollow cathode source with lines in the near ultraviolet, visible, and near infrared, NaF was detected as 1 ppm using a Wadsworth mounting and a 35-ft concave grating spectrograph. Lead dioxide can be detected in quantities as small as 10 μg in concentrations less than 500 ppm. Absorption methods were considered but appeared not to be sensitive or reliable. (F.S.)

2260 CF-52-12-155
Oak Ridge National Lab., Tenn.
THE DETERMINATION OF TRACE ELEMENTS BY NEUTRON RADIOACTIVATION ANALYSIS. G. W. Leddicotte and S. A. Reynolds. Dec. 18, 1952. 11p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Nuclear science has created a new analytical procedure for the determination of trace quantities of many elements. This procedure, called "radioactivation analysis," is a method in which nuclear reactions in a chain-reacting pile (or an accelerator) produce an artificially radioactive isotope of the element being determined. This radioisotope has its own characteristic radiations and mode of decay. Activation analysis is unique because it has great sensitivity of detection for most elements, other elements normally do not interfere seriously because each has its own particular decay constant and type of radiation, and contamination as experienced in most conventional methods is negligible unless present before activation. Techniques of the method of neutron activation analysis, its sensitivities and applications are discussed. (auth)

2261 CF-53-10-52
Oak Ridge National Lab., Tenn.
ANALYSIS FOR TRACE IMPURITIES BY NEUTRON ACTIVATION. W. A. Brooksbank, G. W. Leddicotte, and H. A. Mahlman. Oct. 23, 1953. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The application of radioactivation analysis to selected examples of trace element determinations is reported. The technique of the method of neutron radioactivation analysis and the sensitivities of detection of these elements in a variety of materials are discussed. (auth)

2262 CF-55-1-77
Oak Ridge National Lab., Tenn.
SOME SELECTED METHODS FOR DETERMINING URANIUM AND VANADIUM IN THE PRESENCE OF EACH OTHER. C. D. Susano and L. J. Brady. Jan. 12, 1955. Decl. Feb. 20, 1956. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

2263 CF-55-11-20
Oak Ridge National Lab., Tenn.
NEUTRON ACTIVATION ANALYSIS. G. W. Leddicotte and S. A. Reynolds. Nov. 2, 1955. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Nuclear science has created a new analytical procedure for the determination of trace quantities of many elements. This procedure, called ' activation analysis," is a method in which nuclear reactions in a nuclear reactor (or an accelerator) produce an artificially-radioactive isotope of the element to be determined. This radioisotope has its own characteristic radiations and mode of decay. Activation analysis is unique because it has great sensitivity of detection for most elements, other elements normally do not interfere seriously because each has its own particular decay constant and radiation spectra, and contamination as experienced in most conventional methods is negligible unless present before activation. Of all the nuclear reactions, the neutron reactions have been used most often in activation analysis. This paper discusses the techniques of the method of neutron activation analysis, its sensitivities and applications. Also, the program of neutron activation analysis service at the Oak Ridge National Laboratory is briefly described. (auth)

2264 CF-3748
Argonne National Lab., Lemont, Ill.
DETERMINATION OF HYDROGEN IN SODIUM–POTASSIUM ALLOY. O. C. Simpson and E. G. Rauh. Dec. 23, 1946. Decl. Feb. 16, 1956. 13p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

An analytical procedure for the determination of very low concentrations (~0.1 at %) of H_2 in Na–K alloys is presented. The procedure consists of converting the H_2 present into OH^- ions, equilibrating with D_2O of known concentration, and determining, mass spectrometrically, the dilution of D_2 in the D_2O by H_2. (C.W.H.)

2265 HW-15776
Hanford Works, Richland, Wash.
THE DETERMINATION OF NITROUS OXIDE WITH THE INFRARED SPECTROMETER. R. H. Moore and W. N. Carson, Jr. Jan. 25, 1950. Changed from OFFICIAL USE ONLY July 6, 1956. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

2266 HW-17097
Hanford Works, Richland, Wash.
THE GASOMETRIC DETERMINATION OF NITRITE AND SULFAMATE. W. N. Carson, Jr. Mar. 6, 1950. Changed from OFFICIAL USE ONLY July 6, 1956. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A gasometric determination has been developed that can determine 1.2×10^{-5} g of nitrite with a precision (99% limits) of ±8%. The method is highly specific and few interferences are encountered. The entire procedure requires twenty minutes. For the determination of sulfamate, the modified procedure gives a precision of ±5% for samples containing 2 mg of sulfamate. Interferences with the method are limited to the compounds that contain the amino ($-NH_2$) group. No standard solutions are required and the manipulation of the somewhat complex apparatus is simple. The apparatus is rugged and can be adapted easily for remote control operation. (auth)

2267 HW-34435

Hanford Atomic Products Operation, Richland, Wash.

THE DETERMINATION OF PRODUCT VARIABILITY. Carl A. Bennett. Dec. 30, 1954. 12p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Elementary means of estimating true product variability and its effect on the establishment of control limits of processes are discussed. (F.S.)

2268 K-756

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

CONTINUOUS HYDROGEN FLUORIDE ANALYSIS. W. C. Taylor. May 1, 1951. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

An instrument was developed and tested for continuously analyzing the presence of inert gases in gaseous HF. The instrument uses two critical flow orifices and an HF trap. A constant flow of sample is metered through orifice #1, the major gas component (HF), is removed in a chemical trap and the contaminant gas flow is measured by orifice #2. The instrument was designed for measuring 90 to 100% HF sample. With slight modifications the instrument range may be increased. In the range of 90 to 100% HF the accuracy of the instrument is better than 1% of the HF in the sample. (auth)

2269 KAPL-326

Knolls Atomic Power Lab., Schenectady, N. Y.

DETERMINATION OF MICROGRAM AMOUNTS OF CALCIUM IN VANADIUM METAL. J. Rynasiewicz, R. Guenther, M. E. Sleeper, and R. H. Gale. Mar. 30, 1950. Changed from OFFICIAL USE ONLY June 26, 1956. 7p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

For the determination of Ca in V, it was found necessary to separate the Ca from the V before it could be determined micro-volumetrically. The V was precipitated from an acid solution with cupferron and the cupferride was then extracted with chloroform. The Ca was determined in the aqueous phase as calcium oxalate. Results indicate that as little as 0.20 mg Ca (0.20%) can be determined in 1 g of V with less than a 10% error. In a larger sample the sensitivity is increased percentage wise. (F.S.)

2270 LA-1138

Los Alamos Scientific Lab., N. Mex.

THE REACTION OF TRITIUM AND STOPCOCK GREASE. B. B. McInteer and E. R. Grilly. Aug. 8, 1950. Changed from OFFICIAL USE ONLY July 18, 1956. 8p. Contract W-7405-eng-36. $1.80(ph OTS); $1.80(mf OTS).

The accumulation of hydrogen and tritiated methane, CT_4, was observed in samples of high-purity tritium stored in pyrex glass bulbs with stopcocks. An experiment, however, in which tritium was exposed to large areas of stopcock grease gave negative results for the formation of CT_4. Some N_2 and an unexplained large quantity of CO_2 appeared. Appearance of CO_2 and reduction of CT_4 content was observed after air had been admitted to the methane-contaminated tritium. This is attributed to the reactivity of O_2 in the presence of tritium. Admitting tritium to the spectrometer manifold and sparking the glass with a Tesla-coil leak detector resulted in copious liberation of methane. It is concluded that the methane in the original samples probably occurred in this manner. (C.W.H.)

2271 KAPL-1176

Knolls Atomic Power Lab., Schenectady, N. Y.

THE CONTINUOUS DETECTION AND MEASUREMENT OF LOW CONCENTRATIONS OF OXYGEN IN GASES. L. P. Pepkowitz. June 25, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 29p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The continuous detection and measurement of low concentrations of O_2 in gases is of paramount importance in liquid metal heat transfer technology. This paper describes an instrument based on the dew-point principle for such continuous detection and measurement. A sensitivity of at least 0.0005 vol. % is attained with a mean deviation for precision of ±0.0001 vol. %. The instrument is applicable to the common gases such as N_2, He, the other rare gases, H_2, and CO_2. (auth)

2272 K-1208

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

A PROCESS INSTRUMENT FOR CONTINUOUS HYDROGEN ANALYSIS. D. M. Papke. Apr. 8, 1956. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 24p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

An instrument suitable for process operation was designed and fabricated to continuously analyze and record the mol. % H-in-N in a gas stream containing 80 to 90 mol. % H_2, 0 to 10 mol. % H_2O vapor, and the remainder N_2. The instrument utilized a Leeds and Northrup type 7801 thermal conductivity analyzing unit, which was modified by replacing the glass flow system with stainless steel tubing and adding a flow-meter consisting of a throttling valve, differential pressure transmitter, and a receiver type pressure gage. Parallel water vapor trap systems, capable of regeneration in place, were incorporated into the analyzer to provide freedom from daily trap replacement. The instrument has performed dependably for over two years with only a minimum of maintenance required. (auth)

2273 LA-1645(Del.)

Los Alamos Scientific Lab., N. Mex.

DETERMINATION OF TRITIUM IN URINE AND WATER. Jean McClelland, Morris F. Milligan, Barbara P. Bayhurst, Bernard C. Eutsler, W. W. Foreman, Billye M. Head, Richard D. Hiebert, Richard J. Watts, and William E. Wilson. Mar. 1954. Changed from OFFICIAL USE ONLY with deletions July 18, 1956. 13p. Contract W-7405-eng-36. $3.30(ph OTS); $2.40(mf OTS).

The sample, water or urine, is prepared for counting in a vacuum line. Urine or water is dropped onto metallic Ca, and H_2 and tritium are evolved. The gas flowing into the evacuated system is passed through liquid N_2 cooled traps to remove unreacted water and condensable gases. The gas is allowed to flow into a tube similar to a Geiger-Muller tube until a pressure of 15 cm of mercury is attained. Ethylene and A are added to give a total pressure of 22 cm of Hg. The β activity is counted with a scaling circuit having an input sensitivity of $\frac{1}{4}$ volt. A tube similarly filled with inert H_2 is counted simultaneously to determine the environmental background. The background count is subtracted from the sample count to obtain the true sample count. The method has a precision of ±5% in the range of 1 to 250 μc of tritium per liter of sample. (auth)

2274 LA-1678
Los Alamos Scientific Lab., N. Mex.
A PORTABLE APPARATUS FOR THE DETERMINATION OF TRITIUM IN LIQUID SAMPLES. Jean McClelland, B. C. Eutsler, M. F. Milligan, and W. E. Wilson. May 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 19p. Contract W-7405-eng-36. $4.80(ph OTS); $2.70 (mf OTS).

A glass vacuum manifold and ionization chamber are evacuated and filled to atmospheric pressure with H_2 and T_2. The H_2 and T_2 are evolved by dropping liquid, urine or water, on Ca metal and dired by passing through a suitable freezing bath. The current produced by the beta activity due to T_2 is measured with a vibrating reed electrometer. The method has a precision of ±3% between the ranges of 100 and 1500 μc of T_2/l. From 0 to 100 μc of T_2/l the precision is ±5 to 10%. The glass vacuum manifold has been constructed to fit in an aluminum suitcase which contains all the auxiliary equipment for the determination except the vacuum pump, vibrating reed electrometer, and the freezing bath solutions. The apparatus is sturdy and readily transported. The procedure is simple and adapted for use by untrained personnel. (auth)

2275 MIT-1049
Massachusetts Inst. of Tech., Cambridge.
SPECTROGRAPHIC DETERMINATION OF IMPURITIES IN ZIRCONIUM. John A. Norris. June 30, 1950. Changed from OFFICIAL USE ONLY June 20, 1956. 45p. Contract W-7405-eng-175. $6.30(ph OTS); $3.00(mf OTS).

A general method for the analysis of Zr metal is presented. The method consists of complete burning for the determination of Hf; a partial burning using a graphite buffer for high impurity concentrations; and a pyroelectric burning using a complex buffer carrier mixture for low impurity concentrations. Data are also given on sample preparation and the available information on accuracy and precision is discussed. (auth)

2276 MITG-220
Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.
RADIOASSAY OF PRODUCTS FROM PRECIPITATED PHOSPHATIC MATERIALS. Emilia M. Rubino. Sept. 6, 1949. Decl. Jan. 25, 1956. 24p. Contract AT-30-1-Gen-211. $0.25(OTS).

Tests revealed that barren solutions and precipitates obtained from ammonia precipitation of U from reduced phosphate solutions can be analyzed radiometrically. A proportional relationship exists between the activity of the products and their U content. The solutions and the precipitates were in virtual equilibrium. UX_1, beta-emitting isotope of Th, and U were precipitated in equal proportions and precipitating part of the U by the addition of ammonia did not affect this proportionality. (auth)

2277 MITG-A52
Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.
PRECIPITATION OF URANIUM BY ORGANIC COMPOUNDS. Sara E. Bailey. Dec. 31, 1948. Decl. Apr. 11, 1956. 30p. Contract W-7405-eng-85. $0.25(OTS).

Several organic compounds were tested as precipitating reagents for U artificial solutions and leach solutions from the Rand ores at concentrations of about 50 ppm U_3O_8. The use of excess amounts of long-chain amines gave nearly complete removal of U_3O_8 from these solutions. Tests were run in which the amine was recovered and and reused. (auth)

2278 NYOO-1003
Louisville, Ky. Univ. Inst. of Industrial Research.
PROGRESS REPORT FOR OCTOBER 1949. Gordon C. Williams, Simeon V. Galginaitis, E. G. Baker, Jr., A. H. Isaacs, E. W. Holzknecht, R. A. Gillespie, R. G. Moody, and Robert Kaplan. Nov. 1949. Decl. Jan. 10, 1956. 18p. Contract AT-(30-1)-534. $3.30(ph OTS); $2.40(mf OTS).

Experiments in the determination of vapor pressure data for Hf–Zr tetrachlorides were continued and typical pressure-temperature data are presented. Studies of the chemistry of the $POCl_3$ complex were extended in reactions with CO, Cl_2, and the $POCl_3$ complex. Reactions of the $POCl_3$ complex with phosphorus were attempted with little indication of significant complex break-up. Also extractions of $POCl_3$ from the tetrachloride complex were tried using sym-hepta chloropropane. Operation of stainless steel pilot plant column is reported together with some corrosion data from samples placed in the still pot during operation. (auth)

2279 ORNL-647
Oak Ridge National Lab., Tenn.
DEMINERALIZATION (807) BUILDING OPERATING MANUAL. E. M. Shank and L. L. Fairchild. Nov. 22, 1950. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 95p. Contract W-7405-eng-26. $15.30(ph OTS); $5.40 (mf OTS).

The revised operating procedures, equipment descriptions, and other information necessary to perform the routine operation of the water demineralization building (Building 807) are given, terminating two years of intermittent operational development work by the Pilot Plants Section of the Chemical Technology Division. (auth)

2280 ORNL-747
Oak Ridge National Lab., Tenn.
DETERMINATION OF CHLORIDE IN ZIRCONIUM METAL. P. F. Thomason and M. T. Kelley. Aug. 3, 1950. Decl. Oct. 3, 1956. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Zirconium metal is dissolved in a mixture of H_2SO_4–HF acids and the chloride ion in the range of 5 to 250 ppm is determined by an automatic potentiometric titration with $AgNO_3$. (auth)

2281 RL-4.6.49
[California. Univ., Berkeley. Radiation Lab.]
THE DETERMINATION OF NICKEL IN SOLUTIONS CONTAINING TUBALLOY [URANIUM]. R. G. Mansfield. Mar. 10, 1943. Decl. Sept. 15, 1955. 4p. Contract W-7405-eng-48. (CHEM. S-49). $1.80(ph OTS); $1.80(mf OTS).

A gravimetric method for determination of Ni involving the weighing of nickel-dimethylglyoxime precipitate is described. Citric acid is used to complex Fe, Cr, Al, and U to prevent their interference. Nickel present in amounts as low as 2 mg can be determined to ±5%. (T.R.H.)

2282 TID-5030
Foster Wheeler Corp., New York.
DEVELOPMENT OF FLUID-SAMPLING FACILITIES FOR USE IN CONJUNCTION WITH PROCESS FACILITIES AT U.S.A.E.C. SITE. William Mack and John Irwin. Apr. 26, 1951. Changed from OFFICIAL USE ONLY June 20, 1956. 43p. $12.30(ph OTS); $4.50(mf OTS).

Control and accountability of materials in process at the Arco Plant require periodic sampling at various radioactive levels. Sampling points, design conceptions, and sample taking are discussed. (F.S.)

2283 Y-1091
Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.
THE ISOTOPIC ASSAY OF LITHIUM BY EMISSION SPECTROSCOPY. R. E. Sladky, R. F. Fenske, and O. E. Schow, III. July 1, 1955. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 45p. Contract W-7405-eng-26. $7.80(ph OTS); $3.30(mf OTS).

To determine Li^6 abundance, light from a hollow cathode source of new design was dispersed by means of a high resolution spectrograph and a ratio of the 6707 A line of the Li^6 isotope to the total 6707 A light was obtained. Phototube fatigue was identified as being an important source of variation in this ratio method. A limit of error (95% confidence) of ±3.5% of the Li^6 abundance was obtained for a single aliquant. (auth)

Refer also to abstract 2366.

DEUTERIUM AND DEUTERIUM COMPOUNDS

2284 CF-53-3-157
Oak Ridge National Lab., Tenn.
HUMIDITY AND ENTHALPY OF MIXTURES OF U_2 AND D_2O VAPOR. J. P. Sanders and P. N. Haubenreich. Mar. 23, 1953. Decl. Dec. 9, 1954. 9p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The humidities of mixtures of O_2 saturated with D_2O vapor were calculated in the units of pounds of D_2O per lb of O_2. From these humidities the enthalpies of the mixtures were calculated in Btu per lb of O_2. The reference state for these enthalpy values was zero enthalpy for O_2 at 0°F and zero enthalpy for liquid D_2O at 32°F. Enthalpies for pure O_2 were calculated from the heat capacity equation given in Dodge. Enthalpies for D_2O were obtained by taking the enthalpy of liquid water and adding the product of the latent heat and ratio of the molecular weight of natural water and D_2O. The total enthalpy of the mixture is the sum of the enthalpy of the O_2 plus the humidity multiplied by the enthalpy of D_2O. (auth)

2285 CF-53-4-22
Oak Ridge National Lab., Tenn.
D_2O EVAPORATION IN THE GAS SEPARATOR. John P. Sanders. Apr. 6, 1953. Decl. Dec. 3, 1954. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The amounts of D_2O evaporated in the gas separator at low power levels (no gas production) have been calculated at several operating temperatures. An empirical equation developed by Gilliland for wetted wall columns was used to determine mass transfer coefficients. From these, a coefficient based on enthalpy difference was calculated. This coefficient was used to find the enthalpy of the exit gas and consequently its D_2O content. An alternate method was used to obtain the same result by employing the mass transfer coefficient and a related heat transfer coefficient independently. The results for the two methods of calculation are within the degree of accuracy of the coefficient. (auth)

FLUORINE AND FLUORINE COMPOUNDS

2286 AECD-4213
Purdue Research Foundation, Lafayette, Ind.
FLUOROCARBONS. Final Report on O.S.R.D. Research at Purdue University. E. T. McBee. July 1943. Decl. with deletions Jan. 13, 1956. 114p. Contracts OEMsr-638 and OEMer-853. $18.30(ph OTS); $6.00 (mf OTS).

Procedures are outlined for the determination of halogen content in organic halogen compounds. The syntheses of hexafluoroxylenes, nonafluoromesitylene, nonafluoropseudocumenes, perfluoroheptane, perhalogenated xylenes, perhalogenated ethylbenzene, and fluorolubes are described. (C.W.H.)

2287 AECU-3240
Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
VAPOR PRESSURE-TEMPERATURE RELATIONS ON THE SYSTEM NaF-HF. Wallace Davis, Jr. Sept. 21, 1953. 3p. Contract [W-7405-eng-26]. (KLI-2552). $1.80(ph OTS); $1.80(mf OTS).

2288 CF-51-6-157
Oak Ridge National Lab., Tenn.
CARBON ANODES FOR FLUORINE CELLS. James McLaren. June 18, 1951. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The experimental work indicated that the current density at the fluorine cell anode may be increased from two to twenty times by better control of impurities and the development of anode surfaces. A large increase in cell life should also be possible through better control of impurities and corrosion currents. A testing program for the selection of anodes is proposed and observations would be made on the effect of addition agents in the electrolyte and of variation in the manufacture of C anodes. A third step would be to tie in the results of anode tests with a suitable electrochemical cell design. (auth)

2289 K-649(Del.)
Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
PREPARATION OF CHLORINE TRIFLUORIDE. S. Bernstein, E. W. Powell, and H. A. Bernhardt. Aug. 14, 1950. Decl. with deletions Feb. 2, 1956. 29p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Chlorine trifluoride has been successfully prepared in a Ni reactor by the vapor phase reaction of F_2 and Cl_2 at a temperature of approximately 280°C and a pressure of one atmosphere. A one step method using F_2 to Cl_2 mole ratios in excess of 3 to 1 resulted in a Cl_2 utilization of 95% and a F_2 utilization of approximately 80% when gas contact periods of the order of 2 minutes were allowed. The ClF_3 thus prepared had a purity of greater than 99.5 mole %. (auth)

2290 P-814
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 15 FOR SEPTEMBER 1 – SEPTEMBER 30, 1947. SECTION A. FLUORIDES. P. R. Kalischer. 26p. SECTION B. CHLORIDES. S. J. Morana. 9p. 1947. Decl. Feb. 7, 1956. Contract W-22-075-Eng-11. $7.80(ph OTS); $3.30(mf OTS).

The preparation of Be by the Mg reduction of BeF_2 and the Na reduction of $BeCl_2$ was investigated. The colorimetric determination of F_2 in BeF_2 is described. (C.W.H.)

GRAPHITE

2291 HW-22707(Del.)
Hanford Works, Richland, Wash.
TEMPERATURE DISTRIBUTION IN AN INHOMOGENEOUS CELL. John R. Triplett. Nov. 12, 1951. Decl. with deletions Feb. 2, 1956. 13p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The effects of variable graphite conductivity and of the gas layers in the lattice are investigated under the assumptions that graphite conductivity varies as a power of the distance from the center of each cell and uniform distribution of heat sources. The boundary conditions are assigned on equivalent cylindrical surfaces, and a numerical example given in which only the fundamental and first angular harmonics of the temperature are derived. (auth)

2292 HW-30693
Hanford Atomic Products Operation, Richland, Wash.
THE GRAPHITE-STEAM REACTION. D. M. Knott. Feb. 1, 1954. 5p. Contract [W-31-109-eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

The graphite-steam reaction is of extreme importance to industrial processes, and may be of interest to Hanford operations. The reaction is complex in that its reaction products rapidly undergo further reactions. The reaction is strongly retarded by H and unaffected by CO. Experimental results published in 1934, 1944, and 1952 have been converted to the equivalent basis of per cent per thousand days assuming sample geometry the same as that of the Hanford standard sample. At steam flow rates of approximately 30 cm/sec., and at 850 C, gasification rates of 22,000 and 44,000 per cent per thousand days were observed. At a steam flow rate of 3 cm/sec., and at 870 C, a gasification rate of 13,500 per cent per thousand days was observed. These rates were determined under laboratory conditions and in the absence of radiation. Considerably higher rates might be expected in a Hanford reactor flux. (auth)

LABORATORIES AND EQUIPMENT

2293 AECD-3752 and Suppl.

General Electric Co. General Engineering and Consulting Lab., Schenectady, N. Y.

D. R. DOLLY INSTRUCTION BOOK. Oct. 1948. Changed from OFFICIAL USE ONLY Sept. 13, 1956. 136p. Contract W-31-109-Eng-52. (EAH-81; GEI-28557). $21.30 (ph OTS); $6.90(mf OTS).

Supplement originally issued separately as EAH-81-A.

A small rail car, directly or remotely operated, is described, which is equipped for performing mechanical operations such as twisting, gripping, turning, and cutting, in hazardous areas. Operation and maintenance instructions are given. (T.R.H.)

2294 BNL-27

Brookhaven National Lab., Upton, N. Y.

HOT LABORATORY TECHNICAL REPORT. I. VENTILATION STUDIES ON A RADIOCHEMICAL "SEMIHOT" CELL. John J. Keyes. Sept. 1, 1949. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 24p. $4.80(ph OTS); $2.70(mf OTS).

Observation of smoke patterns together with velocity explorations made possible an appraisal of the exhaust system of a Brookhaven type semihot bench for some anticipated operating conditions. It is concluded that 1400 cfm of air will adequately ventilate the bench and maintain 100 linear feet per minute through all openings. (auth)

2295 CF-55-10-132

Oak Ridge National Lab., Tenn.

DETERMINATION OF THE OPTIMUM PROCEDURE FOR OBTAINING INERT ATMOSPHERES IN NON-VACUUM DRYBOXES. S. I. Cohen and J. M. Peele. Oct. 26, 1955. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

This investigation was carried out to ascertain the optimum procedure for obtaining inert drybox atmospheres by merely purging or sweeping with an inert gas. It was found that heavier-than-air gases should be introduced at the bottom of the drybox and exited at the top, lighter-than-air gases should be introduced at the top of the drybox and exited at the bottom, purging efficiency is decreased with mixing, and purging efficiency is increased as the flow rate is increased. (auth)

2296 CF-55-12-113

Oak Ridge National Lab., Tenn.

HRP-CP: DESIGN OF LEAK DETECTION SYSTEM FOR HRT CHEMICAL PROCESSING PLANT. William L. Carter. Dec. 20, 1955. 13p. Contract [W-7405-eng-26]. $0.20(OTS).

All flanges in the HRT chemical processing area will be equipped with leak detection devices which will inform operating personnel of any malfunctioning of the joint. A $\frac{1}{4}$-in. tube will be attached to each flange, and through this connection pressure can be applied underneath the seal ring. The applied pressure will be higher than that expected in the process system so that if leakage occurs it will be toward the inside of the system. Any leakage will be manifest as a change in pressure in the leak detection system. (auth)

2297 IDO-14165

American Cyanamid Co. Atomic Energy Div., Idaho Falls, Idaho.

CHEMICAL PROCESSING PLANT MAINTENANCE MANUAL. Dean W. Beyer, comp. Oct. 10, 1952. Decl. Apr. 24, 1956. 415p. $63.60(ph OTS); $18.90(mf OTS).

RADIATION CHEMISTRY

2298 MonN-119

[Clinton Labs., Oak Ridge, Tenn.]

HETEROGENEOUS CATALYSIS OF HYDROGEN PEROXIDE DECOMPOSITION. Problem Assignment No. CX5-1. J. P. Hunt, G. L. Johnson, and D. E. Koshland, Jr. June 28, 1946. Decl. Jan. 26, 1956. 11p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

Information is presented on the factors influencing the measurement of H_2O_2 decomposition rates in alkaline solutions. General conclusions are given concerning the obtaining of reproducible data. (auth)

RADIATION EFFECTS

2299 AECD-3741

General Electric Co. General Engineering Lab., Schenectady, N. Y.

THE DECOMPOSITION OF TEFLON IN HIGH-LEVEL GAMMA RADIATION. J. W. Ryan and S. L. Baird, Jr. July 30, 1952. Changed from OFFICIAL USE ONLY June 22, 1956. 8p. (DF52GL174). $1.80(ph OTS); $1.80(mf OTS).

In an attempt to find an insulation stable at high temperatures and resistant to γ radiation, Teflon was chosen because of its ready availability, relatively great changes in mechanical properties under irradiation, ease of x-ray analysis, small chemical reactivity, and simple infrared spectrum. Results indicate that degradation of Teflon by irradiation is due primarily to removal of a F atom followed by double-bond formation or chain rupture. (D.E.B.)

2300 NAA-SR-114(Del.)

North American Aviation, Inc., Downey, Calif.

CHEMICAL STABILITY OF Be_2C UNDER CYCLOTRON IRRADIATION. M. H. Feldman and L. Silverman. May 4, 1951. Decl. with deletions July 26, 1955. 19p. Contract AT-40-1-gen-1064. (M-5724). $0.20(OTS).

Beryllium carbide, Be_2C, was irradiated with 40-Mev alpha particles on the 60-inch cyclotron at Berkeley, while maintained near room temperature in a He atmosphere. Two bombardments, of 34 and 64 μah duration, were made. Chemical analysis of the irradiated material for free Be (which could possibly have been formed by the reaction $Be_2C \rightarrow 2\ Be + C$) indicate that less than one free Be atom is formed per six incident alpha particles. X-ray-diffraction studies of the irradiated material reveal no significant change in structure. The analytical chemistry of Be_2C–Be mixtures is described. (auth)

2301 UCRL-1062

California. Univ., Berkeley. Radiation Lab.

OZONE AND NITROGEN OXIDE PRODUCTION BY

IRRADIATION OF AIR. A. S. Newton. Dec. 21, 1950. Decl. June 11, 1956. 2p. Contract [W-7405-eng-48]. $1.80(ph OTS); $1.80(mf OTS).

It is calculated that the ppm/hr formed at 2×10^4 r/hr for O_3, NO_2, and N_2O are 2.57, 1.17, and 0.118, respectively. (T.R.H.)

SEPARATION PROCEDURES

2302 AECD-3760

United States Vanadium Corp., Uravan, Colo.

OXIDIZED FRACTIONAL PRECIPITATION PROCESS ON "UNREDUCED" URAVAN ACID LEACH "A" LIQUOR. Tests 1-2-3 Performed at Army Laboratory, May and June 1944. L. K. Norton. Changed from OFFICIAL USE ONLY Sept. 28, 1956. 14p. (M-4740). $3.30(ph OTS); $2.40(mf OTS).

The control on the precipitation of the ferric vanadate and basic ferric sulphate is very delicate but the process can be cycled satisfactorily by a careful operator. An important factor of the control is the correct metallurgical balance between ferric iron and V_2O_5 in the liquor. The correct pH for this precipitation and also that of the acid red cake and U_3O_8 cake is equally important. It is necessary to make at least one SiO_2 filtration as long as a strong acid leach is used to make the A liquor but this might be omitted if the process is changed to a weak acid leach which would result in less SiO_2 in the A liquor. The % V_2O_5 of low grade A liquor can be built up to a point where precipitation of acid red cakes of <90% V_2O_5 can be made. The % U of the U_3O_8 cake produced by this process varies directly with the % of the original A liquor. There is no injurious build-up of % P in the acid red cakes as a result of cycling of the process. With proper control there is no loss of "F" in the waste liquor and no loss of V_2O_5 or U_3O_8 in the silica residue. (auth)

2303 AECD-3866

Nevada. Univ., Reno. Mackay School of Mines.

ATTRITIONING OF TEMPLE MOUNTAIN ORE. J. N. Butler, R. W. Stephens, and H. P. Ehrlinger, III. June 19, 1953. Changed from OFFICIAL USE ONLY June 21, 1956. 26p. Contract AT(49-1)-624. (UN-TR-1). $4.80(ph OTS); $2.70(mf OTS).

The results of both dry and wet attritioning of Temple Mountain ore are presented. In order to obtain effective attritioning on this ore, the asphaltite must be removed before attritioning. With the asphaltite present, dry attritioning causes a build-up of asphaltite on the surface of sand grains, with consequent loss of uranium values. In wet attritioning, the asphaltite is not broken down or attritioned, because of its low specific gravity and resilience. (auth)

2304 AECD-4094

California. Univ., Berkeley. Radiation Lab.

LABORATORY STUDIES OF THE PENTAETHER PROCESS FOR THE RECOVERY AND DECONTAMINATION OF URANIUM. T. E. Hicks, P. C. Mayer, and H. W. Crandall. Feb. 16, 1951. Decl. with deletions Feb. 3, 1956. 76p. Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

The desirable properties of pentaether as a solvent in a process for U extraction from an experimental dissolver solution have been illustrated. These are excellent U recovery, fission product decontamination to a level of 1.57 above the natural uranium background by the use of a 16-stage center-fed batch countercurrent mixer-settler, a 1-stage batch strip-extraction, and Ru distillation, good decontamination from ionic Ce, Ba, and La, excellent stability when in contact with 2M HNO_3 and a high level of β, γ, and α radiation. As a disadvantage of the process, Ru must be eliminated in a separate step, either prior to or after any continuous U extraction process. The behavior of Zr is still open to question since ionic Zr proved to be extractable but Zr present in solution was not. The presence of two types of Ru species in a column product stream was shown. Distribution coefficients (organic phase concentration divided by aqueous phase concentration) of 6 and 0.1 were tentatively assigned to these two species. Steady-state U and HNO_3 equilibrium curves have been obtained for various possible flow patterns in countercurrent center-fed columns. (auth)

2305 AECD-4129

Battelle Memorial Inst., Columbus, Ohio.

PROGRESS REPORT FOR THE MONTH OF NOVEMBER 1947. A. E. Bearse, F. C. Croxton, and J. D. Sullivan. Nov. 28, 1947. Decl. Jan. 26, 1956. 8p. Contract AT-30-1-gen-202. (BMI-JDS-1). $1.80(ph OTS); $1.80 (mf OTS).

This contract relates to the recovery of U from shales and to the recovery of U from dilute aqueous solutions by means of organic precipitants or extractable organic uranium compounds. Previous preliminary work on the problem of recovering U from shales has been carried out at intervals over the past year. The investigation of organic precipitants and complexing agents for U has been initiated. This work is directly related to the problem of recovering U from shale, and the results obtained should also be of interest in other applications where the problem of recovering U from dilute aqueous solutions is encountered. (auth)

2306 AECU-3246

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

PERFORMANCE OF FALLING-FILM EVAPORATOR IN CONCENTRATING SYNTHETIC WASTE SOLUTIONS. H. C. Harrison, P. J. Hess, and H. T. Tupper. Apr. 8, 1950. 17p. For Carbide and Carbon Chemicals Div. [K-25 Plant. Contract W-7405-eng-26, Subcontract 70.] (KT-77). $3.30(ph OTS); $2.40(mf OTS).

The operation of the falling film evaporator is described. These runs demonstrate that the waste solutions from ORNL may be successfully concentrated by the falling film evaporator if satisfactory decontamination can be achieved at higher evaporation rates. (T.R.H.)

2307 BMI-235

Battelle Memorial Inst., Columbus, Ohio.

INVESTIGATION OF WASHER SLIMES AS A SOURCE OF URANIUM. Final Report. R. C. Meaders, H. W. Adam, J. W. Cookston, O. F. Tangel, and A. C. Richardson. June 30, 1950. Decl. Apr. 11, 1956. 30p. Contract W-38-094-eng-27. $0.25(OTS).

A description of washer slimes, a waste product of the phosphate industry, is presented. Treatment of these slimes with sulfuric acid dissolves the U and the latter can be recovered by treating the pulp with an anion-exchange resin. U from this source would be very costly. (auth)

2308 BMI-JDS-127

Battelle Memorial Inst., Columbus, Ohio.

ORGANIC PRECIPITANTS AND COMPLEXING AGENTS FOR URANIUM. E. J. Kahler, G. W. Kinzer, G. A. Lutz, R. H. Poirier, and A. E. Bearse. June 30, 1948. Decl. Mar. 5, 1956. 31p. Contract AT-30-1-Gen-202. $0.25 (OTS).

The results of preliminary investigations toward finding an organic precipitant for uranium in acid or Na_2CO_3 solutions are given. Mixtures of amines were effective for U extraction from water leachings of superphosphate. No satisfactory agent was found for Na_2CO_3 or H_2SO_4 solutions of U. (T.R.H.)

2309 BMI-JDS-128
Battelle Memorial Inst., Columbus, Ohio.
THE RECOVERY OF URANIUM FROM CARNOTITE ORES. [Period covered] November 1, 1947 to June 30, 1948. A. C. Richardson, F. M. Stephens, Jr., and D. D. Rabb. June 30, 1948. Decl. Mar. 5, 1956. 22p. Contract AT-30-1-gen-258. $4.80(ph OTS); $2.70 (mf OTS).

Data on the optimum conditions for extraction of U from roscoelite ore as compared with the optimum of carnotite ore are given. The roscoelite ore was less amenable to treatment than the carnotite ore with comparative optimum U extraction figures of 70 and 77%. (J.E.D.)

2310 BMI-JDS-139
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF AUGUST 1948. A. C. Richardson, F. M. Stephens, Jr., and D. D. Rabb. Aug. 31, 1948. Changed from OFFICIAL USE ONLY Mar. 5, 1956. 64p. Contract AT-30-1-gen-258. $10.80(ph OTS); $3.90(mf OTS).

2311 BMI-JDS-143
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF SEPTEMBER 1948. A. E. Bearse, R. A. Ewing, J. F. Foster, G. A. Lutz, and P. D. Miller. Sept. 30, 1948. Decl. Mar. 5, 1956. 32p. Contract AT-30-1-gen-202. $6.30(ph OTS); $3.00(mf OTS).

2312 BMI-JDS-146
Battelle Memorial Inst., Columbus, Ohio.
ORGANIC PRECIPITANTS AND COMPLEXING AGENTS FOR URANIUM. A. E. Bearse, E. J. Kahler, G. W. Kinzer, G. A. Lutz, and R. H. Poirier. Oct. 10, 1948. Decl. Mar. 5, 1956. 27p. Contract AT-30-1-gen-202. $0.25(OTS).

The precipitation of U from acidic phosphate solutions by long-chain amines, complexing and solvent extraction studies, precipitation of U from buffered solutions with arsonic acids, the reduction of U in Na_2CO_3 solutions, and preparation of reagents are reported. (J.E.D.)

2313 BMI-JDS-148
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF OCTOBER 1948. A. E. Bearse, J. F. Foster, E. J. Kahler, P. D. Miller, and H. P. Munger. Oct. 29, 1948. Decl. Mar. 5, 1956. 40p. Contract AT-30-1-gen-202. $7.80 (ph OTS); $3.30(mf OTS).

2314 BMI-JDS-153
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF NOVEMBER 1948. A. E. Bearse, R. A. Ewing, J. F. Foster, G. A. Lutz, P. D. Miller, and H. P. Munger. Nov. 30, 1948. Decl. Mar. 5, 1956. 39p. Contract AT-30-1-gen-202. $6.30(ph OTS); $3.00(mf OTS).

2315 BMI-JDS-158
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF DECEMBER 1948. A. E. Bearse, R. A. Ewing, J. F. Foster, G. A. Lutz, P. D. Miller, H. P. Munger, F. Benington, and J. V. Parker. Dec. 31, 1948. Decl. Mar. 5, 1956. 50p. Contract AT-30-1-gen-202. $7.80(ph OTS); $3.30(mf OTS).

2316 BMI-JDS-160
[Battelle Memorial Inst., Columbus, Ohio].
PROGRESS REPORT FOR MONTH OF DECEMBER 1948. A. C. Richardson, F. M. Stephens, Jr., and D. D. Rabb. Dec. 31, 1948. Changed from OFFICIAL USE ONLY Mar. 5, 1956. 37p. Contract AT-30-1-gen-258. $6.30 (ph OTS); $3.00(mf OTS).

The data indicate that temperature ranges of from 1470 to 1520°F produced the best extractions of U and that these temperature reactions of the salt with the ore tend to volatilize the excess salt from the bed. Salt roasting of Ore C-7 in a fluidized bed at small mesh sizes such as minus 10, 48, or even 100 mesh with high air-flow volumes, salt vapors had a marked agglomerating action on these sizes. Excess residual salt tended to produce a wet snow-like condition in the fluidized bed. Pulsating the air flow to the furnace prevented the formation of blow holes in the fluidized bed and had the effect of promoting smooth operating conditions and even temperatures throughout the bed. The use of coke for generating heat for roasting the fluidized bed resulted in calcines which showed leach solution extractions comparable to those obtained from roasts in which no coke was added and all heating was carried out by external methods. Seven and one half per cent of salt in the raw-ore mix gave extractions equal to those previously obtained with 10 per cent of salt. (auth)

2317 BMI-JDS-162
Battelle Memorial Inst., Columbus, Ohio.
THE RECOVERY OF URANIUM FROM CARNOTITE ORES. Summary Report for the period July 1, 1948 to January 15, 1949. A. C. Richardson, F. M. Stephens, Jr., and D. D. Rabb. Jan. 15, 1949. Decl. Mar. 2, 1956. 28p. Contract AT-30-1-gen-258. $4.80(ph OTS); $2.70(mf OTS).

2318 BMI-JDS-163
Battelle Memorial Inst., Columbus, Ohio.
PRECIPITANTS AND COMPLEXING AGENTS FOR URANIUM. Quarterly Report. A. E. Bearse, G. W. Kinzer, G. A. Lutz, R. D. Morin, and R. H. Poirier. Jan. 15, 1949. Decl. Mar. 2, 1956. 48p. Contract AT-30-1-gen-202. $0.35(OTS).

Studies were continued on the precipitation of UO_2^{+2} from H_2SO_4 solutions by organic compounds of P and As. The use of long-chain amines as precipitants was also studied. Sulphonic acid-type resins gave almost quantitative removal of UO_2^{+2} from dilute acid solutions. (C.W.H.)

2319 BMI-JDS-170
Battelle Memorial Inst., Columbus, Ohio.
URANIUM FROM PHOSPHATE ROCK. Quarterly Report. Iver Igelsrud, J. C. Goodrich, Oscar Tangel, E. F. Stephan, and John Chocholak. Feb. 15, 1949. Decl. Mar. 2, 1956. 34p. Contract W-38-094-eng-27. $6.30(ph OTS); $3.00(mf OTS).

2320 BMI-JDS-175
Battelle Memorial Inst., Columbus, Ohio.
QUARTERLY REPORT FOR THE PERIOD DECEMBER 15, 1948 TO MARCH 15, 1949. Mar. 15, 1949. Decl. Mar. 5, 1956. 118p. Contract AT-30-1-gen-202. $0.60(OTS).

Progress is reported on the recovery of U from domestic shales. Information is included on roasting techniques, leaching variables, and U recovery from leach solutions. A discussion is included covering fuel values of shales. (T.W.S.)

2321 BMI-JDS-182
Battelle Memorial Inst., Columbus, Ohio.
ORGANIC PRECIPITANTS AND COMPLEXING AGENTS FOR URANIUM. Quarterly Report. A. E. Bearse, G. W. Kinzer, G. A. Lutz, R. D. Morin, and R. H. Poirier. Apr. 15, 1949. Decl. Mar. 7, 1956. 38p. Contract AT-30-1-gen-202. $6.30(ph OTS); $3.00(mf OTS).

2322 BMI-JDS-187
Battelle Memorial Inst., Columbus, Ohio.
QUARTERLY REPORT. SECTION I. URANIUM FROM PHOSPHATE ROCK. Iver Igelsrud and James F. Shea. SECTION II. FUNDAMENTAL INVESTIGATION OF THE

SORPTION OF URANIUM FROM SOLUTIONS. J. C. Goodrich and R. Belcher. Mar. 15, 1949. Decl. Mar. 7, 1956. 60p. Contract W-38-094-eng-27. $9.30(ph OTS); $3.60(mf OTS).

2323 BMI-JDS-195

[Battelle Memorial Inst., Columbus, Ohio].
THE RECOVERY OF URANIUM FROM CARNOTITE ORES. Final Report. A. C. Richardson, F. M. Stephens, Jr., D. D. Rabb, R. C. Merritt, and R. D. Kesler. June 30, 1949. Changed from OFFICIAL USE ONLY Mar. 7, 1956. 111p. Contract AT-30-1-Gen-258. $0.60(OTS).

2324 BMI-JDS-204

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF JULY 1949. Iver Igelsrud, G. A. Lutz, Elmer F. Stephan, John Chocholak, J. P. Flynn, R. H. Poirier, and R. L. Belcher. July 29, 1949. Decl. Mar. 8, 1956. 44p. Contract W-38-094-eng-27. $7.80(ph OTS); $3.30(mf OTS).

More than 80% of the U contained in 30% commercial H_3PO_4 was consistently adsorbed on 4 different anion-exchange resins. The U concentration attained on the resin in any single cycle was only about 0.04%. Even assuming that the concentration could be increased to 0.1% and that a resin life of between 100 and 1000 cycles could be realized, a resin cost of $1 to $10 per lb of U is estimated with the cost of the resin at $1 per lb. Preliminary experiments to build up the U concentration on the resin by adsorption and reactivation without elution show some promise, but concentrations as high as 0.1% have not yet been reached. Elution of the U from resins containing up to about 0.04% U with 17.5% H_2SO_4 has produced "rich" eluant fractions containing up to about 200 mg of U per liter, or about three times that contained in the corresponding amount of 30% H_3PO_4. It is unlikely that fractions much richer than this can be obtained by the adsorption-elution scheme used. A better scheme may possibly be to build up the U on the resin, as suggested above, with occasional elution with an eluting agent more efficient than H_2SO_4. Precipitation of U with oxysalt-forming elements was studied and results on unconcentrated acid (about 30% H_3PO_4), on evaporated acid (about 60% H_3PO_4), and by evaporation of the 30% acid with the precipitant. Precipitation of U from 0 to 96% in solution was obtained under various conditions. In general, reduction with Fe prior to precipitation was beneficial. From a reduced 30% acid, BiF_3 precipitated over 96% of the U in a 0.3% precipitate. From reduced evaporated acid, Sb_2O_3 precipitated 26% of the U in a 0.2% precipitate. From 30% H_3PO_4, reduced with Fe and evaporated in contact with the precipitating agents, precipitates were obtained containing 0.12 to 0.33% U with $SnSO_4$, SbO_3, $Al_2(SO_2)_2$, $MnSO_4$, $NiCl_2$, $Bi(NO_3)_3$, BiF_3, and $MgCl_2$. The best recoveries from solution were with Sb_2O_3 (59%), $Bi(NO_3)_3$ (46%), and BiF_3 (32%). In general, oxysalt results have not proved highly promising. (auth)

2325 BMI-JDS-207

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF AUGUST 1949. Iver Igelsrud, Elmer F. Stephan, James P. Flynn, Earl White, Gilbert Dawson, and Ralph L. Belcher. Aug. 31, 1949. Decl. Mar. 8, 1956. 35p. Contract W-38-094-eng-27. $6.30(ph OTS); $3.00(mf OTS).

2326 BMI-JDS-212

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF SEPTEMBER 1949. Iver Igelsrud, Elmer F. Stephan, John Chocholak, Earl White, Gilbert Dawson, and Ralph Belcher. Sept. 30, 1949. Decl. Apr. 11, 1956. 25p. Contract W-38-094-eng-27. $4.80(ph OTS); $2.70(mf OTS).

Uranium from Phosphate Rocks. A search was continued for an inorganic precipitant for U from H_3PO_4. Bismuth salts, Sb salts, alkali oxalates, and oxalic acid are the only materials which produced nearly 100% U from ~30% H_3PO_4 solutions. Before precipitation if the solution was reduced with Fe or if it was oxidized with permanganate, less U was precipitated. Compounds other than Bi and Sb salts or oxalates, organic or inorganic precipitated less than 50% U. Fundamental Investigation of the Sorption of Uranium from Solution. The complexing effect of the phosphate ion on the adsorption of U from uranyl phosphate solution is described. Data include the adsorption of U from a uranyl phosphate as a function of pH as a function of the concentration of U. The U adsorbed from the phosphate solution exceeds that adsorbed from other solutions at the equivalent pH and concentration. Maximum removal of U from the phosphate solution at pH 1 was only 28%. (F.S.)

2327 BMI-JDS-213

Battelle Memorial Inst., Columbus, Ohio.
RECOVERY OF THORIUM AND URANIUM FROM MONAZITE SANDS. Progress Report for September 1949. G. D. Calkins, R. B. Filbert, Jr., and R. H. Poirier. Sept. 30, 1949. Decl. Sept. 8, 1955. 9p. Contract AT-30-1-Gen-228. $1.80(ph OTS); $1.80(mf OTS).

The study of hydroxide precipitate leaching with $NaHCO_3$ and Na_2CO_3 was continued for conditions necessary for high Th recoveries. The effect of concentration of several interfering anions on the adsorption of U by anion exchange resins from Na_2CO_3 solutions was determined. Cl^- ion interferes more seriously than HCO_3^- or OH^- ions. Two runs to dissolve hydrous oxide cake were completed and U and Th recoveries improved. Loss of U to caustic soda was reduced. (F.S.)

2328 CF-50-9-80

Oak Ridge National Lab., Tenn.
CONTINUOUS ION EXCHANGE COLUMN INVESTIGATIONS. S. H. Jury. Aug. 31, 1950. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A continuous column was constructed and used to investigate fluidization characteristics, ion exchange parameters, and physical properties of resin beds. (T.R.H.)

2329 CF-51-8-237

[Oak Ridge National Lab., Tenn.]
SOLVENT EXTRACTION STUDIES: EVALUATION OF PODBIELNIAK CENTRIFUGAL CONTACTOR. Quarterly Report for May through July 1951. J. E. Conaway. Aug. 24, 1951. Changed from OFFICIAL USE ONLY Aug. 10, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

As evidenced by data gathered from the laboratory model, the Podbielniak Centrifugal Contactor can achieve the 0.1% U loss that has been set as a maximum for the Purex 1-C contactor. Since all data were gathered using cold feed, only assumptions can be made about decontamination. It may be assumed that a single centrifugal contactor could meet the minimum requirements for any simple (non-compound) column operation in the Purex Flowsheet, since it is equal to 3+ theoretical stages with the 1-C system. The problem of possible seal leakage was not considered in this study, but should be given consideration before the machine is placed in an operation involving radioactive feeds. (auth)

2330 CF-51-9-151

[Oak Ridge National Lab., Tenn.]
STATISTICAL SURVEY OF PRESSURE DIFFERENTIAL METHODS IN THE DETERMINATION OF LIQUID LEVEL

AND SPECIFIC GRAVITY. E. G. Bianco, A. De la Garza, and A. M. Rom. Sept. 25, 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Significant sources of variance in measuring liquid levels by a pressure-differential system were isolated by conventional statistical methods. Results disclosed that the effects of changing specific gravities, levels, and flow rates as well as a gravity-level interaction were all significant. A liberal estimate of the standard error for the measurability of any liquid level was derived as ±0.10". In the measurement of specific gravity by such a system only the effects of two interactions were shown to be significant. These were the gravity-level interaction and the probe separation-flow rate interaction. Assuming further sources of variance, a rather high estimate of the standard error for the measurability of one specific gravity was derived, viz., ±0.007 gravity units. A measurable rise in the level of the liquid was observed in all of these determinations. This apparently resulted from an elongation of the air column within the probe extending from the tip of the bubble rather than from the tip of the probe itself. (auth)

2331 CF-51-12-43
New Brunswick Lab., AEC, N. J.
THE DISTRIBUTION OF URANYL NITRATE IN A NITRIC ACID, TRIBUTYL PHOSPHATE AND WATER SYSTEM. M. W. Lerner and George Petretic. Dec. 4, 1951. Decl. Oct. 18, 1955. 14p. $4.80(ph OTS); $2.70(mf OTS).

2332 CF-52-2-50
Oak Ridge National Lab., Tenn.
A SEARCH FOR A RELIABLE SULFATE ANALYSIS OF URANYL SULFATE: THE ION EXCHANGE METHOD. H. O. Day, J. S. Gill, E. V. Jones, and W. L. Marshall. Feb. 7, 1952. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An experimental survey was made of various analytical methods for uranyl sulfate containing varying sulfate content. Of these methods the ion exchange removal of U and subsequent titration of sulfate appears the most promising. A description of the ion exchange procedure is given. The method is much faster than the gravimetric $BaSO_4$ analysis and should yield results within ±0.25% on duplicate or triplicate analyses. (auth)

2333 CF-52-6-169
Oak Ridge National Lab., Tenn.
A PROBLEM STATEMENT [ON] THE COMPOSITE BUBBLE CONTACTOR—RESEARCH STUDY. Robert A. Fisher. June 27, 1952. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A proposed research program for a counter current liquid-liquid contractor was made. The composite bubble contactor is to be reconstructed, operated, and modified to obtain pressure drop and mass transfer data. (F.S.)

2334 CF-52-7-162
Oak Ridge National Lab., Tenn.
PRESSURE AND POWER CALCULATION METHODS FOR PULSE COLUMNS. H. F. Johnson. July 28, 1952. 9p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Equations have been developed for pulse columns whereby pressure at the bottom of the tower and at the pulser can be computed as a function of the phase angle. Equations for instantaneous power requirements as a function of phase angle, and for the power requirement when the driver operates in conjunction with a flywheel, have also been developed. (W.L.H.)

2335 CF-52-11-57
Oak Ridge National Lab., Tenn.
SOLUBILITY AND DISTRIBUTION OF DI(2 ETHYL HEXYL) PHOSPHINIC ACID. W. H. Baldwin. Nov. 5, 1952. Decl. Feb. 6, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The solubility and distribution of di(2-ethylhexyl) phosphinic acid is discussed. As an aid to the analysis the di(2-ethylhexyl) phosphinic acid was prepared with P^{32} in the molecule. The yellow product obtained had an equivalent weight of 296 (calculated 290) and phosphorus content of 10.96 and 10.70% (calculated 10.67%). (W.L.H.)

2336 CF-54-11-185
Oak Ridge National Lab., Tenn.
DESIGN OF A PILOT PLANT TO STUDY LIQUID-LIQUID EXTRACTION OF URANIUM FROM ACIDIC SULFATE LEACH LIQUORS. B. B. Klima, J. F. Manneschmidt, and J. R. Buchanan. Nov. 30, 1954. Decl. Feb. 20, 1956. 51p. Contract W-7405-eng-26. $9.30(ph OTS); $3.60(mf OTS).

The design of a pilot plant for the Amine Extraction Process is given. Criteria, material balances, equipment, and calculations are included. (T.R.H.)

2337 CF-55-8-101
Oak Ridge National Lab., Tenn.
PLATE-TYPE GRAPHICAL AND ANALYTICAL ANALYSIS AND DESIGN OF COUNTERCURRENT ION EXCHANGE RECOVERY COLUMNS. S. H. Jury. Aug. 19, 1955. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The plate-type graphical and analytical procedures for the analysis of data from and the design of continuous or semi-continuous countercurrent ion exchange columns are summarized. The ion exchange medium of such columns operates on an equivalent or heterovalent ion system in such a manner as to strip from a dilute feed liquor an ion of value and thus in the elution section of the column to produce a purified product solution which is considerably more concentrated. (auth)

2338 CF-55-9-152
Oak Ridge National Lab., Tenn.
INVESTIGATION OF AN ION-EXCHANGE SEPARATION PROCEDURE. M. M. Vick and G. W. Leddicotte. Sept. 30, 1955. 5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A brief description is presented of the anionic behavior of metals with an ion-exchange resin–HCl system. An attempt is being made to adapt radioactivation analysis for use as a separation method in qualitative analysis. (W.L.H.)

2339 HW-15233
Hanford Works, Richland, Wash.
DENSITY AND VISCOSITY OF SOLUTIONS IN THE TRIBUTYL PHOSPHATE PROCESS FOR URANIUM RECOVERY. L. L. Burger and C. M. Slansky. Nov. 29, 1949. Decl. Apr. 23, 1956. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(ph OTS).

Density and viscosity data for solutions of $UO_2(NO_3)_2$ and HNO_3 in TBP mixtures are presented. (W.L.H.)

2340 HW-17822
[Hanford Works, Richland, Wash.]
REFRACTIVE INDEX MEASUREMENTS. L. L. Burger. May 17, 1950. Changed from OFFICIAL USE ONLY July 6, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Current physical studies of Redox solutions and current metal waste solutions have included a number of refractometric investigations. Aside from information pertinent to the structural nature of solutions these data have revealed that the refractions of a number of constituents in

process streams are sufficiently different from those of the solvents that analytical application is possible. The purpose of this note is to summarize some of these data and to point out a few limitations of the method. Refractometric methods for analysis and control in organic chemistry are well known. Lack of extensive use in analysis of inorganic solutions has resulted probably from the lack of specificity for individual ions and to the fact that other methods were available. (auth)

2341 HW-20305

[Hanford Works, Richland, Wash.]

DESIGN CONSIDERATIONS FOR A PULSE COLUMN SYSTEM. V. R. Cooper and C. Groot. Mar. 9, 1950. Changed from OFFICIAL USE ONLY July 6, 1956. 9p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The hydraulic forces in the countercurrent flow, vertical type extractor pulse column were evaluated and their effects on pulse column design were determined. (F.S.)

2342 HW-39560

Hanford Atomic Products Operation, Richland, Wash.

A NEW APPROACH TO PULSE COLUMN PIPING. R. C. Hollingshead and J. Oliver Ludlow. Oct. 17, 1955. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A pulse column using a pulse generator with two interconnecting lines containing check valves is described. The pulse generator accelerates alternately the fluid in each of the pipes. The need for a remote flange is eliminated, smaller pipes are used, and remote pulse generators will not be necessary. (F.S.)

2343 IDO-14079

American Cyanamid Co. Atomic Energy Div., Idaho Falls, Idaho.

IDO LIQUID WASTE PLANT, CPP 604 BUILDING OPERATING EQUIPMENT MANUAL. S. F. Fairbourne, V. W. Irvine, A. M. Larson, B. H. Macklin, L. G. Pearson, and H. L. Sexton, comps. May 22, 1952. Changed from OFFICIAL USE ONLY May 29, 1956. 164p. Contract [AT(10-1)-177]. $25.80(ph OTS); $7.80(mf OTS).

A manual is presented dealing with information on some of the equipment in building CPP 604. The equipment is arranged according to number and a brief description and function are given. WM equipment is used in storage of liquid waste and WL is used in treating liquid wastes in the 604 area. A sketch of the vessels, heat exchangers and instruments is shown, giving nozzle arrangement and size. Additional information can be found from the fabricators or reference drawing numbers that are given. (J.E.D.)

2344 IDO-16273

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

RADIOANALYSIS OF THE MTR PROCESS WATER OFF-GAS STREAM. R. L. Heath and T. O. Passell. Oct. 21, 1955. 6p. Contract AT(10-1)-205. (PTR-10). $1.80(ph OTS); $1.80(mf OTS).

The following fission product gaseous activities have been identified by direct observation on a 100-channel γ scintillation spectrometer: Kr^{87} (78 min), Kr^{85} (4.4 hr), Kr^{88} (2.8 hr), Xe^{135} (9 hr), and Xe^{133} (2.3 day and 5.3 day). Quantitative measurement of the nuclides Xe^{138} (17 min) and Xe^{139} (41 sec) was obtained by analysis for their respective daughter activities Cs^{138} (33 min) and Ba^{139} (85 min). The discharge rate for these two nuclides was found to be 0.8 mc Xe^{138}/sec and 0.05 mc Xe^{139}/sec. From the ratio of Xe^{138} to Xe^{139} it is possible to calculate a total delay time from original production to exit from flash evaporators. This was found to be 5.6 minutes. The major activities observed in the gas stream were fission products. (auth)

2345 M-4228

Princeton Univ., N. J. Frick Chemical Lab.

THE RATIO OF WATER TO URANYL NITRATE IN THE SOLVENT PHASE AFTER EXTRACTION FROM AQUEOUS SOLUTION. J. A. DiPace and N. H. Furman. Apr. 1947. Decl. Oct. 6, 1955. 10p. $1.80(ph OTS); $1.80 (mf OTS).

Results indicate that 4 H_2O molecules are carried with each $UO_2(NO_3)_2$ molecule during the ether extraction of $UO_2(NO_3)_2$ from solutions containing high NO_3^- concentrations. (C.W.H.)

2346 MITG-212

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

ATTRITION SCRUBBING OF WESTERN CARNOTITE AND ROSCOELITE ORES. Edmund G. Brown. Mar. 7, 1949. Changed from OFFICIAL USE ONLY Mar. 14, 1956. 40p. Contract AT-30-1-gen-211. $0.30(OTS).

An attrition scrubber was tested in the scrubbing of western carnotite and roscoelite ores. Tests indicated that the sand product increased in purity as the amount of work put into the scrubbing increased. The time of scrubbing was of maximum importance. Speed, pulp density and size of charge had progressively less effect on the purity of the sand product. The choice of a scrubbing procedure will depend chiefly on economic considerations, that is, the value of the product less the cost of power required and the cost of subsequent treatment per ton. The Fall Creek roscoelite ore and the Gypsum Valley carnotite ore responded best to scrubbing, while the Rico roscoelite ore and the Mexican Hat carnotite ore gave the poorest response. (auth)

2347 MITG-222

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

WET SCRUBBING OF WESTERN PHOSPHATE ORES. Edmund G. Brown. Oct. 25, 1949. Changed from OFFICIAL USE ONLY Mar. 14, 1956. 48p. Contract AT-30-1-gen-211. $7.80(ph OTS); $3.30(mf OTS).

Two submarginal-grade western phosphate ores were beneficiated by scrubbing and desliming. Both ores responded well to this simple treatment, and an acid-grade phosphate product was obtained from each by any of three different methods of scrubbing; namely, treatment in an attrition scrubber, in a slow-moving cylindrical mill with steel punchings, or by self-attrition in a cylindrical mill. The acid-grade phosphate product contained from 69 to 93% of the U and from 78 to 94% of the phosphate. Time of scrubbing and pulp density were found to be important. A short time of scrubbing in a thin pulp gave better results than a long time of scrubbing in a thick pulp. Best results were obtained with pulps containing 50% solids. Overscrubbing will result in lower reocvery of both U and phosphate. (auth)

2348 MITG-A53

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

THE RECOVERY OF URANIUM FROM LOW-GRADE LEACH LIQUORS BY SELECTIVE PRECIPITATION. Eugene J. Michal. Nov. 24, 1948. Decl. Apr. 11, 1956. 22p. Contract W-7405-eng-85. $0.25(OTS).

A selective precipitation process for the recovery of U from acid leach liquors has been investigated. Iron is oxidized with MnO_2, removed as $Fe(OH)_3$ and returned to the process as an oxidant. U, Al and Si are separated by bulk precipitation, resolution and reprecipitation of the

Al and Si in a $NaCO_3$ solution. The U is recovered from the $NaCO_3$ filtrate by acidification, to destroy the carbonate, followed by precipitation with NH_4OH, or by direct precipitation with NaOH. Provision is made for the recovery of MnO_2 and Na_2CO_3 for reuse in the process. (auth)

2349 MITG-A63

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

RADIOACTIVITY MEASUREMENTS AT CONTINUOUS COUNTERCURRENT LEACHING TEST. James H. Pannell, Emilia M. Rubino, Wilfred Freyberger, and Donald W. Haney. Mar. 21, 1949. Decl. Apr. 11, 1956. 36p. Contract W-7405-eng-85. $0.30(OTS).

An attempt was made to assay the pregnant solution continuously by β counting during the continuous countercurrent leaching operation. The attempt failed because of a separation of U^{238} from Th^{234} at the pH used. (F.S.)

2350 MITG-A64

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

EXPERIMENTS ON RAND LEACH LIQUORS WITH CATION EXCHANGE RESINS. Norman N. Schiff. Aug. 1, 1949. Decl. Apr. 13, 1956. 52p. Contract W-7405-eng-85. $9.30(ph OTS); $3.60(mf OTS).

A dewatering process using Nalcite HCR, a high capacity strong-acid type cation exchange resin, when applied to a Rand ore leach liquor will produce a solution with a five-fold concentration of all cations but without silica. This solution might be treated more economically to produce a high-grade U product. The capital cost of the resin for the ion exchange step is not prohibitive. (auth)

2351 MITG-A76

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

ACID LEACHING OF LOW-GRADE URANIUM PRECIPITATES FROM RAND ORES. John J. Brunner, Robert L. Barnard, and Sara E. Bailey. Oct. 28, 1949. Decl. Apr. 13, 1956. 27p. Contract W-7405-eng-85. $4.80(ph OTS); $2.70(mf OTS).

Low-grade U-containing precipitates obtained from Rand ore leach liquors may be upgraded by digestion of the precipitates as acid slurries for about 16 hours at 90°C and a pH of 3.2 to 3.5. These slurries filter readily giving concentrated U-bearing solutions containing little Fe or silica and only part of the Al. Other processes which were studied for the acid leaching of this material were unsatisfactory. (auth)

2352 MITG-A81

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

EXTRACTION OF URANIUM FROM RAND PRECIPITATES WITH CARBONATES. PART II. MULTIPLE AND COUNTERCURRENT LEACHING. Charles S. Abrams and David Kaufman. Feb. 7, 1950. Decl. Apr. 13, 1956. 26p. Contract W-7405-Eng-85. $4.80(ph OTS); $2.70(mf OTS).

Experiments on the extraction of U from low-grade precipitates obtained from Rand ores by leaching with carbonate solutions are described. The beneficial effect of a preliminary water leach was confirmed, and, with a water leach, three additional leaches with Na_2CO_3 extracted more than 95% of the U from an MgO precipitate low in Fe. A countercurrent leaching test was run on this type of precipitate demonstrating that 95% of the U could be extracted with the consumption of 12 lb of Na_2CO_3 per lb of U contained. Additional tests were made on precipitates obtained with $CaO \cdot MgO$ and on precipitates containing more Fe. It was found that these also could be extracted with carbonate with good recoveries although the carbonate consumption was increased. (auth)

2353 NYOO-1450

Ionics, Inc., Cambridge, Mass.

FINAL REPORT FOR JULY 5, 1949 TO OCTOBER 31, 1949. Oct. 31, 1949. Changed from OFFICIAL USE ONLY Aug. 24, 1956. 9p. Contract AT(30-1)-665. $1.80(ph OTS); $1.80(mf OTS).

Anion-exchange separation on Dow A-2 resin of mixed $ZrF_6^{-2}-HfF_6^{-2}$ solutions was carried out. No significant separation was achieved by the use of conventional elution techniques. Separations yielding 70 to 80% Zr containing Hf/Zr ratios 65 to 75% of originals were achieved through the use of combined precipitation-development on a single column with 1.5N NH_4F at pH 8. (auth)

2354 NYOO-1451

Ionics, Inc., Cambridge, Mass.

PROGRESS REPORT FOR JULY 5, 1949 TO SEPTEMBER 26, 1949. Oct. 13, 1949. Changed from OFFICIAL USE ONLY Aug. 10, 1956. 49p. Contract AT(30-1)-665. $7.80(ph OTS); $3.30(mf OTS).

Preliminary work on anion-exchange separation of Zr–Hf mixtures indicate no significant separation by conventional eluting techniques. A separation of Zr and Hf by precipitation of hydroxide from fluozirconate solutions was obtained, and transfer of this process applying resin-precipitation elution techniques has been attempted. (auth)

2355 ORNL-1446

Oak Ridge National Lab., Tenn.

URANIUM CHEMISTRY OF RAW MATERIALS SECTION PROGRESS REPORT [FOR] JULY 1, 1952 TO SEPTEMBER 30, 1952. PART I. URANIUM FROM LIGNITES. K. B. Brown, F. A. Schimmel, and R. C. Nelson. Nov. 13, 1952. Decl. May 29, 1956. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Studies were continued on the recovery of U from raw lignite and lignite ash by acid leaching. Attempts to concentrate the U by air classification of raw lignite were unsuccessful. (C.W.H.)

2356 ORNL-1480

Oak Ridge National Lab., Tenn.

URANIUM CHEMISTRY OF RAW MATERIALS SECTION PROGRESS REPORT [FOR] JULY 1, 1952 TO SEPTEMBER 30, 1952. PART II. STUDIES IN URANIUM CHEMISTRY: SOLVENT EXTRACTION. C. A. Blake, J. G. Moore, and W. M. Whaley. Dec. 6, 1952. Decl. May 29, 1956. 68p. Contract W-7405-eng-26. $10.80(ph OTS); $3.90(mf OTS).

Work on U chemistry of raw materials included investigations of the solvent extraction of U from aqueous nitrate, sulfate, phosphate, and fluoride solutions and mixtures through use of organic complexing agents, especially organic P compounds. The screening program for organic P compounds was continued. A new phosphinic acid, di(3-heptyl)-, two new phosphonic acids, 2-ethylhexyl- and 3-heptyl-, and a mixture of mono- and didecylphosphoric acids were prepared. Extraction of U from nitrate, phosphate, and sulfate solutions by these materials are reported. Tri(2-ethylhexyl) phosphine oxide gave good extractions of U. Di(2-ethylhexyl)phosphoric acid showed promise as an extractant for western mill liquors. Use of this reagent in processing a Rifle-type liquor gave high-grade U. Extractions with 2-ethylhexylphosphonic acid from nitrate, phosphate, sulfate, and fluoride solutions are reported. The solubility and distribution of di(2-ethylhexyl)phosphinic acid in water and acid solutions were determined. Several amines were tested for extracting U(VI) from sulfate and sulfate–phosphate liquors. Studies were made of several methods for stripping U from organic

solvents. Stripping of U-bearing organic phase with aqueous carbonate or hydroxide solutions is discussed. Detailed description is presented of the preparation of various intermediates, phosphinic acids, phosphonic acids, phosphoric esters, amines, and a phosphine oxide. (See ORNL-1384 for preceding quarter.) (W.L.H.)

2357 ORNL-1903
Oak Ridge National Lab., Tenn.
THE EXTRACTION AND RECOVERY OF URANIUM (AND VANADIUM) FROM ACIDIC LIQUORS WITH DI(2-ETHYLHEXYL) PHOSPHORIC ACID AND SOME OTHER ORGANOPHOSPHORUS ACIDS. C. A. Blake, K. B. Brown, and C. F. Coleman. May 13, 1955. Decl. May 29, 1956. 130p. Contract W-7405-eng-26. $0.75(OTS).

The recovery of U and V from acid leach liquors by solvent extracting with di(2-ethylhexyl) phosphoric acid in an organic diluent has been studied. The co-extraction of possible interfering ions such as Fe and Al was also studied. Other organophosphorus acids were investigated as possible extracting agents. (C.W.H.)

2358 RL-4.6.315
California. Univ., Berkeley [Radiation Lab.].
THE ELECTROLYTIC REDUCTION–pH CONTROL METHOD OF SEPARATION OF [U] FROM CONTAMINANTS. E. L. Wagner. July 28, 1943. Decl. Sept. 15, 1955. 5p. Contract [W-7405-eng-48]. (CHEM. S-315). $1.80(ph OTS); $1.80(mf OTS).

The electrolytic reduction and the pH control methods of separating U from metallic contaminants are described and interference by Cr is discussed. (T.R.H.)

2359 Y-360
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROGRESS REPORT ON CARNOTITE STUDIES [FOR] FEBRUARY 1949. K. B. Brown, C. F. Coleman, and C. D. Susano. Mar. 8, 1949. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 58p. Contract W-7405-eng-26. $10.80(ph OTS); $3.90(mf OTS).

Investigations carried out for the carnotite program have been concerned with further investigation of the effects of NaCl, H_2O, SO_2, time, temperature, and bed-depth on the roasting of Uravan stockpile ore, re-examination of the salt-roasting of Cactus Rat ore, lot 254, determinations of materials dissolved, other than U and V, upon leaching the calcines from salt roasts of various ores, studies of the manner of uranium retention in salt roast tailings, continued investigations of factors which affect the amount of HCl produced during the roasting treatment, further determinations of HCl requirements for leaching of calcines derived by roasting various ores under a variety of conditions, laboratory studies of the comparative filtration properties of raw ore, roasted ore, and sand tailings from sand-slime separations, and a few additional studies of steps in a wet concentration process. (auth)

2360 Y-501
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
STUDIES OF RECOVERY PROCESSES FOR WESTERN URANIUM BEARING ORES. IV. URANOUS PHOSPHATE–VANADIC PHOSPHATE PRECIPITATION PROCESS. W. F. Arendale and C. F. Coleman. Oct. 31, 1949. Decl. May 29, 1956. 72p. Contract W-7405-eng-26. $12.30(ph OTS); $4.50(mf OTS).

A process, including a recommended flowsheet, is described for the recovery of U and V from the acid leach liquors obtained in the normal processing of carnotite ores. After reduction with Fe, the U and V are precipitated separately as phosphates. A carbonate fusion of the uranous phosphate leaves a uranium dioxide product of good purity. Material balances and product analyses are included. (auth)

2361 Y-747
Oak Ridge National Lab., Y-12 Area, Tenn.
STUDIES OF RECOVERY PROCESSES FOR WESTERN URANIUM BEARING ORES. PART X. RECOVERY OF URANIUM FROM A MARYSVALE ORE BY SULFURIC ACID LEACH AND URANOUS PHOSPHATE PRECIPITATION. Preliminary Report. D. J. Crouse, F. G. Seeley, and C. F. Coleman. June 18, 1951. Decl. May 29, 1956. 37p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00 (mf OTS).

A complete process for the recovery of U from ore from the Marysvale district is presented on a preliminary basis. Steps outlined for this process include leaching by sulfuric acid, followed by precipitation of the U as uranous phosphate. Results of leaching tests with other agents are included. (auth)

2362 Y-794
Oak Ridge National Lab., Y-12 Area, Tenn.
STUDIES IN THE CARBONATE–URANIUM SYSTEM. PART III. SPECTROPHOTOMETRIC INVESTIGATION OF THE CARBONATE–URANYL COMPLEXES. C. A. Blake, R. S. Lowrie, K. B. Brown, and D. G. Hill. Aug. 20, 1951. Decl. May 29, 1956. 47p. Contract W-7405-eng-26. $7.80 (ph OTS); $3.30(mf OTS).

Additional evidence for the existence in solution of the uranyl tricarbonate ion, $UO_2(CO_3)_3^{-4}$, was obtained by continuous variation spectrophotometric methods. Evidence was also obtained for the presence in Na_2CO_3 solutions of two additional complex ions having carbonate to uranium combining ratios of 0.5 and 2.0. Though not uniquely proven, the ionic compositions appear to be $UO_2(CO_3)^{-2}$ dicarbonate ion, and $U_2O_5OHCO_3^-$, semicarbonate ion. The stability of these ions in salt solutions and the effect of hydrogen ion concentration have been studied. Concentrations of each of these ions in various solutions have been estimated by a method which involves the measurement of the pressure of CO_2 over these solutions and subsequent calculation of the amount of uncomplexed carbonate in solution. Using these data, approximations have been made of the extent of the dissociation of the tricarbonate ion and the dicarbonate ion. (auth)

2363 Y-823
Oak Ridge National Lab., Y-12 Area, Tenn.
URANIUM CHEMISTRY OF RAW MATERIALS SECTION PROGRESS REPORT [FOR] JULY 1, 1951 TO SEPTEMBER 30, 1951. Oct. 30, 1951. Decl. May 29, 1956. 58p. Contract W-7405-eng-26. $9.30(ph OTS); $3.60(mf OTS).

Studies were continued on the physical properties of $UO_2CO_3-CO_3^{2-}$ systems, ionic analysis of $(UO_2)_3(PO_4)_2$ solutions, solvent extraction of UO_2^{2+}, and sorption of U on ion exchange resins. The recovery of U from Bartow Clay, high-lime carnotite ores, and Marysvale-type ores, and the recovery of V from carnotites were investigated. (C.W.H.)

Refer also to abstract 2297.

SORPTION PHENOMENA

2364 BMI-JDS-224
Battelle Memorial Inst., Columbus, Ohio.
ADSORPTION OF URANYL SALTS FROM ACIDIC SOLUTIONS BY ACTIVATED CHARCOAL. R. L. Belcher and G. A. Lutz. Jan. 31, 1950. Decl. Apr. 11, 1956. 52p. Contract W-31-094-eng-27. $0.35(OTS).

Results indicate that removal of U from strongly acidic

solutions by adsorption on activated charcoal cannot be accomplished effectively. Depending on the type of solution, adsorption of UO_2^{2+} ion does not become significant until the pH is increased to the range of 2 to 3. The amount of U adsorbed at equilibrium on a steam-activated charcoal was not affected by the particle size of the charcoal. However, the adsorption rate was increased when the particle size of the charcoal was decreased. Since adsorption of UO_2^{2+} ion was not affected by de-ashing the charcoal, it was concluded that the inorganic constituents in the charcoal did not play an important part in the adsorption mechanism. (auth)

2365 SC-1851(TR)(Del.)
Sandia Corp., Albuquerque, N. Mex.
SILICA GEL. A. M. Lansche. June 25, 1951. Decl. with deletions Apr. 27, 1956. 23p. $4.80(ph OTS); $2.70(mf OTS).

Sorptive and physical properties of silica gel are outlined. Methods of regeneration are discussed. (C.W.H.)

TRANSURANIC ELEMENTS AND COMPOUNDS

2366 CN-2726
[California. Univ., Berkeley. Radiation Lab.]
ANALYSIS FOR Pu(III) AND Pu(IV) ON A TRACER SCALE. E. L. King. Dec. 1, 1944. Decl. Feb. 14, 1956. 28p. Contract W-7405-eng-48B. $4.80(ph OTS); $2.70(mf OTS).

Several procedures for the tracer scale analysis of solutions containing Pu^{3+} and Pu^{4+} have been studied. Niobium oxide was found to carry Pu^{4+} to the extent of 90% under conditions where 3 to 4% of Pu^{3+} (in the presence of $NH_2OH \cdot HCl$) was carried. This method would probably be unsuccessful since the presence of sulfate is necessary if one wishes to obtain a readily centrifugable precipitate and the oxidation of Pu^{3+} by O_2 of the air in the presence of sulfate is known to proceed at an appreciable rate. It was found that Pu^{4+} was carried to an extent of 96% by thorium pyrophosphate. Under similar conditions Pu^{3+} was carried to the extent of only 1%. Further investigation might prove the use of this procedure to be highly feasible. The use of zirconium phenylarsonate to carry Pu^{4+} and at the same time leave Pu^{3+} in the supernatant solution has been investigated quite thoroughly. It was found that Pu^{3+} was carried to an extent of about one percent both in the presence or absence of $NH_2OH \cdot HCl$. The zirconium phenylarsonate was found to carry about 98% of the plutonium present as Pu^{4+}. The presence of low concentrations of HNO_3 or Cl_2 was necessary, however, to maintain plutonium in the +4 oxidation state. Chlorine at a concentration sufficient to prevent the reduction of tracer concentrations of Pu^{4+} does not oxidize Pu^{3+} at an appreciable rate. Such is not true inthe case of HNO_3 however, as it was found that Pu^{3+} was oxidized at a measurable rate under conditions where the plutonium was effectively held in the +4 oxidation state. Mixtures of Pu^{3+} and Pu^{4+} were analyzed by the zirconium phenylarsonate procedure. The agreement between the known percent of Pu^{4+} and that derived from the analysis assuming quantitative carrying of Pu^{4+} and non-carrying of Pu^{3+} was quite good. It has been found that the colloidal form of Pu^{4+} is also carried by zirconium phenylarsonate while Pu^{6+} is not carried. (auth)

2367 ISC-14
Ames Lab., Ames Iowa.
THE CHELATE COMPOUNDS OF PLUTONIUM (thesis). Frederick John Wolter. May 25, 1946. Decl. Jan. 6, 1956. 104p. Contract W-7405-eng-82. $16.80(ph OTS); $5.70(mf OTS).

TRITIUM AND TRITIUM COMPOUNDS

Refer to abstracts 2611 and 2270.

URANIUM AND URANIUM COMPOUNDS

2368 A-605
[Westinghouse Electric Corp. Lamp Div.], Bloomfield, N. J.
URANIUM METAL DEVELOPMENT AT BLOOMFIELD, MARCH 1 TO AUGUST 1, 1942. John W. Marden. Mar. 23, 1943. Decl. Feb. 21, 1956. 64p. $10.80(ph OTS); $3.90(mf OTS).

Procedures and equipment for the production of U cubes are described. Uranyl nitrate is converted to KUF_5 which is subsequently electrolyzed to U; the electrode product is powdered and then vacuum-melted to specifications. (C.W.H.)

2369 A-1241
Columbia Univ., New York. Div. of War Research.
THE OXIDATION OF URANIUM OXIDE–WATER SLURRIES BY HYDROGEN PEROXIDE. Clyde A. Hutchison, James S. Smith, and Ashton M. Lyon. Feb. 15, 1944. Decl. Jan. 16, 1956. 39p. Contract W-7405-eng-50. (100K-R-591). $9.30(ph OTS); $3.60(mf OTS).

2370 A-1255
Columbia Univ., New York. Div. of War Research.
THE CONVERSION OF SMALL SAMPLES OF URANIUM SALTS TO URANIUM HEXAFLUORIDE FOR ISOTOPIC ANALYSIS ON THE MASS SPECTROMETER. T. S. Will, M. G. Inghram, and B. M. Rustad. Mar. 24, 1944. Decl. Jan. 16, 1956. 13p. Contract W-7405-eng-50. $3.30(ph OTS); $2.40(mf OTS).

A procedure for the direct fluorination of U_3O_8 with F_2 to produce UF_6 is described. Diagrams of the ground glass valves and sylphon needle valves used in the conversion apparatus are included. (C.W.H.)

2371 A-3971
Princeton Univ., N. J. Frick Chemical Lab.
TERMINAL REPORT [FOR APRIL 15, 1943–APRIL 14, 1946]. N. H. Furman. May 21, 1946. Decl. Oct. 6, 1955. 20p. Contract W-7405-Eng-81. $4.80(ph OTS); $2.70 (mf OTS).

Research programs of the Princeton Analytical Group are briefly discussed. A bibliography of research reports of the group is included. (C.W.H.)

2372 AECD-3689
Tennessee Eastman Corp., Oak Ridge, Tenn.
CRITICAL IONIZATION OF POTENTIALS OF URANIUM HEXAFLUORIDE. A. E. Cameron and J. R. White. Jan. 17, 1946. Decl. Nov. 28, 1955. 8p. Contract [W-7405-Eng-23]. (B-6.460.9). $1.80(ph OTS); $1.80(mf OTS).

The critical ionization potentials of monovalent ions produced by slow electron bombardment of UF_6 have been determined. The ions were identified by mass spectrometric means. The critical ionization potentials for UF_6^+, UF_4^+, UF_3^+, UF_2^+, and U^+ are respectively 15.5, 20.1, 23.5, 29.9, 37.9, and 50.3 v. A probable error of from 5% for UF_5^+ to 15% for U^+ is likely. (W.L.H.)

2373 AECD-3855
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE ALUMINUM NITRATE PROCESS FOR THE CONVERSION OF TUBALLOY TETRAFLUORIDE [UF_4] TO TUBALLOY PEROXIDE [UO_4]. E. J. Lord, L. J. Andrews, and J. W. Gates, Jr. Aug. 22, 1945. Decl. Dec. 21, 1955. 2p. Contract W-7401-eng-23. (C-1.365.4). $1.80(ph OTS); $1.80(mf OTS).

Quantitative conversion of UF_4 to UO_4 is achieved by dissolution in boiling $Al(NO_3)$ solution and extraction of U from the cool, $Al(NO_3)_3$ saturated, solution with dibutyl carbitol. (T.R.H.)

2374 AECD-4064

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

PURIFICATION OF URANIUM TETRACHLORIDE BY FRACTIONAL CONDENSATION. H. S. Young. Apr. 1, 1947. Revised by C. D. Susano Oct. 3, 1949. Decl. Dec. 7, 1955. 11p. Contract W-7405-eng-26. (H-1.740.8 (Paper 4(Rev.)). $1.80(ph OTS); $1.80(mf OTS).

The effect of a single vacuum sublimation of contaminated UF_4, with fractional condensation of the vapors, was investigated to determine whether a high degree of purity would result. It was found that this procedure was an excellent and simple method for obtaining exceedingly pure uranium tetrachloride. (auth)

2375 AECD-4173

Tennessee Eastman Corp., Oak Ridge, Tenn.

RECOVERY OF URANIUM FROM BETA SALVAGE RESIDUES BY VAPOR PHASE CHLORINATION WITH CCl_4. R. W. Veatch, Jr. and A. J. Miller. Apr. 22, 1946. Decl. Jan. 30, 1956. 10p. Contract W-7401-eng-23. (C-2.320.5). $1.80(ph OTS); $1.80(mf OTS).

A process for the recovery of U from ignited B salvage residues was developed. It consisted of a vapor phase chlorination with CCl_4 for about four hours followed by H_2O and HNO_3 leaching. Recoveries are estimated at 60 to 90% of the total U content. (W.L.H.)

2376 AECD-4182

[Tennessee Eastman Corp., Oak Ridge, Tenn.]

THE PREPARATION OF ANHYDROUS WHITE SALT [UO_2F_2] IN GREEN SALT [UF_4] TYPE BOX REACTORS. K. O. Johnsson and G. H. Clewett. Jan. 29, 1946. Decl. Feb. 14, 1956. 2p. (C-5.381.14). $1.80(ph OTS); $1.80 (mf OTS).

Uranyl fluoride can be produced by the reaction of UO_3 or UO_4 with HF under an O_2 atmosphere for several hours at 300°C in the UF_4-type box reactors. (C.W.H.)

2377 AECD-4224

Tennessee Eastman Corp., Oak Ridge, Tenn.

RECOVERY OF URANIUM FROM FIBERGLAS AIR FILTERS. R. H. Adams, J. A. Rogers, and K. B. Brown. Aug. 5, 1946. Decl. Feb. 21, 1956. 9p. Contract W-7401-eng-23. (C-2.320.6). $1.80(ph OTS); $1.80(mf OTS).

Various procedures for extracting uranium from Fiberglas air filters have been tested and compared. Satisfactory results which involve the least amount of handling are obtained by simply washing the material with hot 1:1 hydrochloric acid. (auth)

2378 AECD-4236

Carbide and Carbon Chemicals Div. [K-25 Plant], Oak Ridge, Tenn.

THE PREPARATION AND SOME PROPERTIES OF A URANIUM HEXAFLUORIDE–SODIUM FLUORIDE COMPLEX. Charles A. Horton, Warren W. Harris, John T. Barr, and J. C. Posey. Nov. 30, 1950. Decl. Feb. 9, 1956. 6p. Contract [W-7405-eng-26]. (KLI-753). $1.80 (ph OTS); $1.80(mf OTS).

2379 AECU-3243

Carbide and Carbon Chemicals Co. [K-25 Plant], Oak Ridge, Tenn.

THE EFFECT OF FLUORIDE ION CONCENTRATION ON THE PRECIPITATION OF URANIUM AS AMMONIUM DIURANATE. J. L. Fritts and P. F. Shorten. June 17, 1954. 7p. Contract [W-7405-eng-26]. (KLI-3033). $1.80(ph OTS); $1.80(mf OTS).

In a study of ways to reduce the complexing effect of the fluoride ion to increase U recoveries in the precipitation as ammonium diuranate from uranyl fluoride solutions, dilution reduced the fluoride complexing effect, but extensive dilution was not practical because of greater losses in increased volumes of filtrates. Dilution versus recovery curves showed that optimum dilution for maximum U recovery is about 0.2 fluoride ion/liter with a U concentration of 5 ppm in the supernate. (F.S.)

2380 BMI-251

Battelle Memorial Inst., Columbus, Ohio.

THE CONCENTRATION OF PITCHBLENDE. Progress Report. A. L. Wesner, O. F. Tangel, and A. C. Richardson. Dec. 31, 1950. Changed from OFFICIAL USE ONLY Oct. 10, 1955. 20p. Contract AT-30-1-Gen-228. $3.30(ph OTS); $2.40(mf OTS).

The results of leaching studies on sulphide froth products from the flotation of high-sulphur pitchblende are presented. The distribution of Mo in flotation products is also given. (auth)

2381 BMI-JDS-132

Battelle Memorial Inst., Columbus, Ohio.

PROGRESS REPORT FOR THE MONTH OF JULY 1948. A. E. Bearse, J. F. Foster, and G. A. Lutz. July 30, 1948. Decl. Mar. 5, 1956. 15p. Contract AT-30-1-gen-202. $3.30(ph OTS); $2.40(mf OTS).

Additional roasting studies in a tube furnace and in a muffle furnace have demonstrated the importance of obtaining a complete roast if extractions in the 70% range are to be realized. If the temperature was too low the U was not solubilized, and if the temperature was too high, extraction decreased. Thermal decomposition studies indicated that UO_2SO_4 is destroyed gradually at 1200°F to give a product which is insoluble in dilute H_2SO_4. Chlorination roasting of shale has shown that a particle size range of −200 mesh and +235 mesh was the most satisfactory for U recovery. Extractions of 80% were obtained with an aqueous Na_2CO_3 leach after chlorination. The use of a leach solution prepared by saturating water with off-gases from the roasting of shale offered considerable promise with a 61% extraction of U. The principle advantage of this type of leach is that the amounts of Fe and Al dissolved were low of the order of 3 to 6 times the U in solution as contrasted with 60 to 70 times with 1% H_2SO_4. Results indicate that leaching with dilute acid at room temperature was feasible. (auth)

2382 BMI-JDS-210

Battelle Memorial Inst., Columbus, Ohio.

RECOVERY OF URANIUM FROM SHALES. VOLUMES I AND II. Final Report. R. A. Ewing, G. A. Lutz, and A. E. Bearse. Sept. 30, 1949. 367p. Contract AT-30-1-Gen-202. $1.75(OTS).

Originally issued in two parts as Vol. I (BMI-JDS-210), Decl. Mar. 9, 1956, and Vol. II (BMI-JDS-210A), Decl. Mar. 12, 1956.

The experiments at BMI on recovery of U from shales are summarized. The experiments were concerned with evaluation and development of the roast-leach and the raw shale leach processes. Operating cost and capital investment estimates are given. The recovery of U from the leach solutions is included in the experiments. (T.R.H.)

2383 CF-52-1-93

Oak Ridge National Lab., Tenn.

DENSITY-WEIGHT PERCENT MOLARITY CONVERSION EQUATIONS FOR URANYL SULFATE–WATER SOLUTIONS AT 25.0°C AND BETWEEN 100-300°C. W. L.

Marshall. Jan. 15, 1952. Decl. Feb. 7, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Equations were evaluated from density-molarity data for uranyl sulfate–water solutions at 25.0 ± 0.2°C and densities for UO_2SO_4 solution are given from 22.3 to 371.5°C. Equations for obtaining densities are accurate to ±0.5% from 25 to 300° for solutions not over ~10 weight percent. For higher concentrations they appear accurate to better than ±1.0% between 120 and 250°C. (F.S.)

2384 CF-54-11-129

Oak Ridge National Lab., Tenn.

ALKALINE URANIUM CARBONATE SOLUTIONS. H. F. McDuffie. Nov. 23, 1954. Decl. Apr. 4, 1956. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A feasibility study on the utilization of alkaline UO_2CO_3 solutions as reactor fuels was initiated. (C.W.H.)

2385 HW-38219

Hanford Atomic Products Operation, Richland, Wash.

THE STUDY OF A METHOD OF ASSAYING THE APPROXIMATE ISOTOPIC RATIO IN URANIUM. A. W. Thiele. July 15, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

2386 K-78

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.

PURIFICATION OF DEPLETED URANIUM OXIDE. J. S. Fox. Nov. 21, 1947. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 25p. Contract [W-7405-eng-26]. $4.80 (ph OTS); $2.70(mf OTS).

The method used for the purification of 11.5 kg of depleted U_3O_8, is described. U_3O_8 with a purity of between 99.98 and 99.99% was obtained using a diethyl ether extraction followed by a hydrogen peroxide precipitation. Isotopic and chemical uniformity was insured by having a solution of the entire sample in a single container before the final peroxide precipitation. The tests which led to the choice of this method of purification and a gravimetric method of analysis used as a check of the spectrographic analyses are also described. (auth)

2387 K-417

Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.

PRECISION OF THE CARRIER DISTILLATION SPECTROCHEMICAL DETERMINATION OF TRACE ELEMENTS IN URANIUM. A. L. Hallowell, Osmer Carpenter, and L. H. Rogers. June 14, 1949. Decl. May 29, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Using a logarithmic transformation, the 95% confidence interval for a single analysis of U_3O_8 by the carrier distillation spectrochemical method is approximately from one-half to twice the amount reported. Statistical results are given showing the increase in precision obtained by averaging replications; for example, if 4 determinations are averaged the confidence interval is from 70 to 142% of the amount reported. The two main sources of error are believed to be first, from uncontrolled conditions in the arc stream producing differential line excitation and background radiation and second, by the limitations of the visual observation method. (auth)

2388 M-2126

Johns Hopkins Univ., Baltimore.

MONTHLY TECHNICAL REPORT FOR THE PERIOD MAY 1 THROUGH MAY 31, 1945. W. B. Burford, III. Decl. Jan. 7, 1956. 14p. Contract W-7401-eng-43. $3.30(ph OTS); $2.40(mf OTS).

Progress is reported on the precipitation of UO_4 from α and β gunk. Powder diffraction data for UCl_4 are tabulated. (C.W.H.)

2389 MCW-10

Mallinckrodt Chemical Works, St. Louis.

THE PREPARATION OF URANOUS AND URANYL SULFATE. David T. Copenhafer. Apr. 1, 1946. Decl. Dec. 7, 1955. 14p. Contract W-7405-eng-1. $0.20(OTS).

Uranous sulfate was prepared by reacting UO_2 at 100°C with a 10% excess of concentrated H_2SO_4 in water. The rate of reaction of micro-pulverized UO_2 with concentrated H_2SO_4 at 160°C showed a conversion to $U(SO_4)_2$ in 7 to 10 hrs. Regular granulated UO_2, due to its slow reaction rate, could not be used. The $U(SO_4)_2$ has to be recrystallized in the presence of excess H_2SO_4 to avoid hydration and insoluble salt formation. Uranyl sulfate was also prepared by reacting stoichiometric quantities of ground UO_3 with 21.5% H_2SO_4. (F.S.)

2390 MITG-207

Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.

ACID-LEACHING OF WESTERN CARNOTITE ORES. Norman N. Schiff. Sept. 30, 1948. Decl. Jan. 25, 1956. 24p. Contract AT-30-1-gen-211. $0.25(OTS).

A group of preliminary acid-leaching tests was run on six samples of western carnotite ores. The U extraction was of primary interest. An inexpensive, simple, cold, dilute-acid leach, as developed at the MIT Mineral Engineering Laboratory, was applied successfully to these ores. (auth)

2391 MITG-218

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

PRECIPITATION OF URANIUM FROM ANACONDA 27°Bé PHOSPHORIC ACID WITH POTASSIUM OR CALCIUM HYDROXIDES. Robert J. Woody and Galen W. Clevenger. Mar. 30, 1950. Decl. May 14, 1956. 23p. Contract AT-30-1-Gen-211. $3.30(ph OTS); $2.40(mf OTS).

Samples of H_3PO_4 were reduced and partially neutralized with KOH and with lime. Between pH 1.5 and 2.5, 99% of the U precipitated with KOH. It required 1600 lb of KOH/lb of U_3O_8 precipitated. Results with $Ca(OH)_2$ were not as good, the precipitate produced being hard to dewater. (T.R.H.)

2392 MITG-261

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

AIR OXIDATION OF URANOUS SOLUTIONS. James H. Pannell. Dec. 21, 1950. Decl. Jan. 11, 1956. 23p. Contract AT-30-1-Gen-211. $0.20(OTS).

Rates of oxidation of uranous (U^{4+}) solutions by air under various conditions similar to those prevailing in ore leach liquors were determined. (auth)

2393 MITG-A49

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

CARBONATE TREATMENT OF U_3O_8 PRECIPITATES. Gilman Y. Murray and John Dasher. June 21, 1948. Decl. Apr. 11, 1956. 24p. Contract W-7405-eng-85. $0.25(OTS).

2394 MITG-A51

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

THE LEACHING OF URANIUM FROM INSOLUBLE HYDROXIDES BY A CARBONATE TREATMENT. Eugene J. Michal. Sept. 30, 1948. Decl. Apr. 11, 1956. 28p. Contract W-7405-eng-85. $0.25(OTS).

The complete leaching of small amounts of U from metal-hydroxide precipitates, using sodium carbonate-bicarbonate

solutions as leaching agents, has been studied. Information has been obtained concerning the effect on uranium extraction of such fundamental variables as time, temperature, pH, concentration of carbonate, and state of oxidation of U. (auth)

2395 MITG-A62

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

PHOSPHATE PRECIPITATION OF URANIUM FROM RAND ORE LEACH SOLUTIONS AND RETREATMENTS OF THE PHOSPHATE PRECIPITATES. Sara E. Bailey. June 1, 1949. Decl. Apr. 13, 1956. 18p. Contract W-7405-eng-85. $3.30(ph OTS); $2.40(mf OTS).

Uranium was precipitated from reduced acid-leach solutions with phosphate and limestone. Solutions did not contain enough U to make possible selective precipitation of U. Complete precipitation of U by phosphate was obtained in many tests by bulk precipitation of the leach solution at pH 4.2. Retreatment of this bulk precipitate produced a uranous phosphate cake (40% U_3O_8), with 20 to 40% recovery of U_3O_8. (auth)

2396 MITG-A75

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

NEUTRALIZATION OF REDUCED RAND LEACH SOLUTIONS. Robert L. Barnard. Dec. 16, 1949. Decl. Apr. 13, 1956. 29p. Contract W-7405-eng-85. $4.80(ph OTS); $2.70(mf OTS).

A study was made of controlled neutralization of reduced leach solutions from Rand ore. The influence of pH of precipitation was studied in detail. It was found that the distribution of U between a precipitate and the mother liquor is directly dependent upon the pH of precipitation while the grade of the precipitate bears an inverse relationship to the pH. Good recoveries as high-grade precipitates were obtained only from artificially upgraded solutions. High recoveries as low-grade low-iron precipitates were obtained with a single precipitation at high pH (5.5 to 6.0). Fe was not precipitated if good reduction was maintained during precipitation. From the few data obtained on the reduction step, metallic Fe and metallic Al appear to be equally efficient reducing agents. On the basis of a few tests, a small amount of sodium hydrosulfite appears to be beneficial in maintaining reduction during the precipitation process. Larger amounts of hydrosulfite or of sulfite prevent precipitation of U, probably by forming soluble complexes. The addition of fluoride to the reduced solution before neutralization did not appreciably improve results. (auth)

2397 MITG-A86

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

EXTRACTION OF URANIUM FROM RAND PRECIPITATES WITH CARBONATES. PART III. TESTS ON PRECIPITATES FROM TYPE Y AND Z (SINGLE STAGE) LEACH LIQUORS. David Kaufman and Charles S. Abrams. July 1, 1950. Decl. Apr. 13, 1956. 41p. Contract W-7405-eng-85. $6.30(ph OTS); $3.00(mf OTS).

Carbonate leaching of precipitates made by addition of calcined dolomite to acid leach liquors from single stage, cyclic and noncyclic tests showed that over 95% of the U could be extracted with carbonate from all types of precipitates but that the carbonate consumption per pound of U recovered varied inversely with precipitate grade. By following the optimum procedure for leaching and precipitation it was possible to obtain precipitates averaging 5% U_3O_8 on which carbonate consumption with multistage countercurrent leaching should be of the order of 20 pounds of Na_2CO_3 per pound of U_3O_8 recovered. (auth)

2398 NYO-2017

New Brunswick Lab., AEC, N. J.

THE DENSITIES OF TRIBUTYL PHOSPHATE–KEROSENE–URANIUM–NITRIC ACID SOLUTIONS FROM 30–70°C. G. J. Petretic, A. R. Eberle, and R. Beaumont. May 4, 1951. Decl. Oct. 18, 1955. 32p. $6.30(ph OTS); $3.00(mf OTS).

In the extraction of U with TBP, impurities are controlled in the concurrent extraction by the percent saturation of the organic phase with U. One of the suggested methods of controlling saturation is by the density. Densities of TBP–kerosene–U solutions as affected by concentration of TBP, U, HNO_3, and temperature were determined. (F.S.)

2399 NYO-3794

Metal Hydrides Inc. Chemical Research Lab., Beverly, Mass.

THE REDUCTIONS OF URANIUM OXIDES. Quarterly Report No. 3. Robert W. Bragdon. Apr. 10, 1953. Decl. Sept. 20, 1956. 12p. Contract AT(30-1)-1350. $3.30(ph OTS); $2.40(mf OTS).

Progress on a program designed to evaluate methods of preparing uranium hydride from the various oxides of uranium is presented. The current portion of the investigation is concerned with the reduction of UO_2, UO_3, and U_3O_8 with calcium hydride and calcium metal, and twenty-three such reductions are described. The evaluation of the various products by chemical analyses has demonstrated that reductions are more quickly and completely effected in the absence of a H atmosphere. Chemical analyses of the most recent reductions have indicated uranium hydride contents greater than 99%. It is concluded that the presently employed methods of evaluation of the products are inadequate for products approaching 100% purity, and steps have been taken toward their evaluation after processing to massive metal by powder metallurgical techniques. (auth)

2400 NYO-5182

Mallinckrodt Chemical Works, St. Louis, Mo.

DETERMINATION OF CHLORIDE IN URANIUM COMPOUNDS. R. Z. Bouton. June 21, 1946. Decl. Sept. 20, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

The erratic results obtained in the determination of Cl in U compounds and in AAA ore were investigated. It was found that an appreciable loss of Cl is likely to occur in material dissolved in concentrated HNO_3 and that satisfactory leaching may be had even in AAA ore by the use of weak HNO_3 and gentle heating, without danger of loss through vaporization of HCl. (F.S.)

2401 NYO-5185

[Mallinckrodt Chemical Works, St. Louis].

THE USE OF PHOSPHORIC ACID IN THE DETERMINATION OF FREE UO_2. J. R. McCoy. June 29, 1946. Decl. Sept. 15, 1955. 4p. $1.80(ph OTS); $1.80(mf OTS).

Data show that H_3PO_4 is effective in dissolving UO_2 and that this may be done quantitatively with assurance in atmosphere. The poor checks which were encountered are in part explained by the poor quality of the material and the small sample would effectively increase the accuracy and it should be possible to dissolve a gram of UO_2 in 20 ml H_3PO_4. Further work was discouraged as the amount of material involved was slight and of such a poor quality that oxidation continued to take place after assaying. (auth)

2402 RL-4.6.23

[California. Univ., Berkeley. Radiation Lab.]

PRODUCTION OF TCl_4 [UCl_4]. H. R. McCombie. Feb. 20, 1943. Decl. Sept. 15, 1955. 13p. Contract W-7405-eng-

48. (CHEM. S-23). $3.30(ph OTS); $2.40(mf OTS).

The gas phase reaction of $UO_2 + CCl_4 \rightarrow CO_2 + UCl_4$ will be used for UCl_4 production. The influence of such variables as temperature, rates, surface, agitation, and corrosion is investigated. Detailed information on construction of the continuous reactor is included. (T.R.H.)

2403 RL-4.6.930

[California. Univ., Berkeley. Radiation Lab.]
THE AUTOXIDATION OF TUBALLOUS SOLUTIONS. PART II. Ambrose R. Nichols, Jr. Aug. 25, 1945. Decl. Sept. 15, 1955. 16p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Using methods previously devised, a continuation of studies into the rate of autoxidation of UCl_4 solutions to UO_2Cl_2 is reported. (T.R.H.)

2404 Y-464

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
RECOVERY FROM SHALE LEACH LIQUORS AS URANOUS PHOSPHATE. W. R. Grimes and G. H. Clewett. Aug. 9, 1949. Decl. May 18, 1956. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

A general picture of the problem of U recovery from H_2SO_4 leaches of oil shales is presented. Some experiments are offered to show that carried precipitation of $U_3(PO_4)_4$ serves to produce a residue containing 12 to 15% U_3O_8 and containing 90% of the U originally present. It is suggested that this technique may be applicable to leach solutions from other raw materials of more immediate promise. (auth)

2405 Y-571

Oak Ridge National Lab., Y-12 Area, Tenn.
STUDIES OF RECOVERY PROCESSES FOR WESTERN URANIUM-BEARING ORES. PART VIII. EXAMINATION OF CERTAIN ASPECTS OF THE "CARBONATE PROCESSES" AS USED AT MONTICELLO, UTAH. R. S. Lowrie and K. B. Brown. Feb. 20, 1950. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 63p. Contract W-7405-eng-26. $10.80(ph OTS); $3.90(mf OTS).

Maximum build-up of U in the recycling carbonate leach liquors of both raw and salt-roasted ore, solubilities of certain uranyl vanadates in Na_2CO_3 solutions, solubility of sodium uranyl tricarbonate in Na_2CO_3 solutions, analyses for carbonate in the mill liquor, and carbonate consumption during leaching are discussed. Some information is also presented on the organic content of the mill liquors, the filtering and settling of raw leach slurries, and the recycle of effluent liquors from the "yellow-cake" precipitation. (auth)

2406 Y-664

Oak Ridge National Lab. Y-12 Area, Tenn.
SOLUBILITY OF URANOUS p-TOLUENESULFINATE AND RELATED COMPOUNDS. W. F. Arendale and C. F. Coleman. Oct. 5, 1950. Decl. May 29, 1956. 32p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

A series of aromatic sulfinic acids was prepared and purified. The solubilities of Zr, Hf, Th, uranous, and ferric p-toluenesulfinates and of other uranous sulfinates were determined, with emphasis on the Th and U compounds. A discussion of the structure of the aromatic sulfinate ion is included. (auth)

Refer also to abstracts 2351, 2393, 2484, 2485, and 2557.

WASTE DISPOSAL

2407 BNL-59

Waste Processing Committee, AEC.
CONFERENCE ON WASTE PROCESSING, [HELD AT BROOKHAVEN NATIONAL LABORATORY], MARCH 27-28, 1950. SECTION 2. EVAPORATION. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 43p. $7.80(ph OTS); $3.30(mf OTS).

A process involving evaporation and de-entrainment for concentrating large volumes of slightly contaminated liquid wastes of low solid content. The requirements of such a process are that it give a concentrate which was investigated may be stored economically and a condensate sufficiently low in activity that it may be discharged directly to the sewer. The ease with which this latter requirement may be met is obviously dependent upon the tolerance level set by the laboratory. BNL has proposed that the maximum concentration of radioactive contaminants in the liquid wastes to be released from the Laboratory shall not exceed 3×10^{-11} c/ml, and that the average concentration over a 3-month period shall not exceed 3×10^{-12} c/ml. It has been estimated that for the liquid waste anticipated an over-all decontamination factor from feed to product of approximately 10^6 may be required to attain this low level. Several methods of evaporation and de-entrainment for effecting this decontamination have been investigated, the results of which are described. Only nonvolatile radioactive materials were considered. (auth)

2408 CF-51-10-138

Oak Ridge National Lab., Tenn.
DESIGN CALCULATIONS FOR THE WASTE SYSTEM EVAPORATOR REBOILER WL-300, WASTE EVAPORATOR CONDENSER WL-301, AND EJECTOR EXHAUST CONDENSER WL-302. A. F. Arruzza. Oct. 16, 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 31p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

2409 CF-54-10-64

Oak Ridge National Lab., Tenn.
DISPOSAL OF NUCLEAR POWER REACTOR WASTES BY INJECTION INTO DEEP WELLS. Preliminary Report. D. A. Pecsok. July 1954. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Subterranean disposal of liquid wastes has been utilized by various chemical industries, notably the petroleum industry. Some of the published findings with regard to these field applications are summarized and the feasibility of this method of disposal for nuclear power reactor wastes is considered. Geographical, economic, chemical, and temperature considerations are discussed in detail. (auth)

2410 CF-55-8-97

Oak Ridge National Lab., Tenn.
THE IMPACT OF RADIOACTIVE WASTE DISPOSAL ON CHEMICAL PROCESSING. Conrad P. Straub and E. G. Struxness. Aug. 15, 1955. 16p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

An attempt was made to bring to attention the need and desirability of reconsidering and reexamining fuel element construction, reactor operation techniques, chemical processing procedures, and waste disposal practice now in use to produce less hazardous and toxic waste effluents. Pre-treatment for the removal of some of the longer-lived materials such as Sr^{90} and Cs^{137} is also pertinent. (auth)

2411 MLM-532

Mound Lab., Miamisburg, Ohio.
DEVELOPMENT OF THE FLOW SHEET FOR THE MOUND LABORATORY LIQUID WASTE EVAPORATION SYSTEM. Engineering Research Final Report. G. W. Frink, R. L. Bates, and M. McEwen. Dec. 8, 1950. Changed from OFFICIAL USE ONLY July 30, 1956. 9p. Contract AT-33-1-GEN-53. $6.30(ph OTS); $3.00(mf OTS).

The development of a flowsheet for the decontamination of radioactive liquid wastes is described. The entire liquid

waste handling system is grouped and discussed under the headings: collection, neutralization, evaporation and condensation, distillate storage, instrumentation, sampling, and shielding. A drawing showing the recommended design of a large liquid waste evaporator is included. (T.R.H.)

2412 MonH-258
[Clinton Labs., Oak Ridge, Tenn.]
RADIOACTIVE FISSION PRODUCT CONTAMINATION IN THE MUD OF WHITE OAK DRAINAGE SYSTEM. J. S. Cheka and K. Z. Morgan. Mar. 20, 1947. Changed from OFFICIAL USE ONLY Aug. 10, 1956. 24p. Contract W-35-058-eng-71. $3.30(ph OTS); $2.40(mf OTS).

The White Oak Creek drainage basin is used for the disposal of radioactive wastes. The water is purified to a large extent by the precipitation and adsorption on clay and organic material of many of the radioactive isotopes. Deposition of activity has varied with changes in plant processes. During the years when Pu separation was the chief process, deposition ratio between the marsh at the upper end of the basin and the mouth of the White Oak Creek differed by a factor of about 10^4, the marsh having values up to 0.4 μc/g of surface mud. Later when Ba separation was the chief process, values at the marsh dropped to less than half of the previous values, but the deposition ratio differed by a factor of less than 1000 between the above mentioned points. A later assay of total curie content in the basin showed about 70 curies still being retained by the mud. This figure is 13% of the estimated total activity released into the basin between the beginning of operations and the time of the survey. Chemical analyses indicate that the distribution of isotopes also changed; Ba, Sr, and Cs totals being less than 1% increasing to about 50%, Zr and Nb totals, meanwhile, dropping from about 75% to about 2%. (auth)

2413 NYO-4003
New York Operations Office. Health and Safety Div., AEC.
RADIATION FROM RADIUM BEARING SLUDGE STORAGE TOWERS. Eugene V. Barry. Apr. 1952. Changed from OFFICIAL USE ONLY Aug. 17, 1956. 16p. $3.30(ph OTS); $2.40(mf OTS).

Design data are presented for radium bearing sludge storage towers including information as to amount of radiation that could be expected from towers of different diameter through the concrete wall at points external to the tower. (auth)

ENGINEERING

2414 AECU-3306
[Sandia Corp., Albuquerque, N. Mex.]
ELECTROFILM: LUBRICANT-SOLID FILM COATING. C. E. Dahl and P. J. Langdon. [1953]. 11p. (TM-214-53-16). $1.80(ph OTS); $1.80(mf OTS).

The properties and uses of solid film lubricant coatings are given. These are mixtures of MoS_2, Pb, Sn, Sb, In, Ag, and graphite with a resin base. (T.R.H.)

2415 AECU-3307
[Sandia Corp., Albuquerque, N. Mex.]
PORTABLE PULSE GENERATOR. R. Creveling. Feb. 25, 1954. 7p. (TM-25-54-54). $1.80(ph OTS); $1.80(mf OTS).

A small portable battery-operated pulse generator is described. Fast-rising 500-v pulses capable of driving low impedance circuits are produced. Pulses may be produced manually as required, or automatically over a wide range of repetition rates. (auth)

2416 CF-55-4-159
Oak Ridge National Lab., Tenn.
THERMAL STRESS IN TUBE-HEADER JOINTS. A. S. Thompson. Apr. 26, 1955. 6p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A study was made of the stress and axial variation in temperature in the attachment of a tube to a header using a larger concentric tube between the header sheet and the joint. A low tensile gradient can thus be maintained. (F.S.)

2417 CF-55-10-83
Oak Ridge National Lab., Tenn.
MODIFICATIONS TO UNDERFLOW POT AND COOLING SYSTEM. H. O. Weeren. Oct. 17, 1955. Decl. Feb. 20, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Design information is presented on the underflow retention tank which is used for the temporary storage of the concentrated wastes separated from reactor solution by the hydroclone. Modifications in the temperature regulating system of the tank are also outlined. (C.W.H.)

2418 HW-32456
Hanford Atomic Products Operation, Richland, Wash.
TROUTDALE INVESTIGATION OF HIGH DENSITY CONCRETES. H. S. Davis. July 16, 1954. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 22p. Contract W-31-109-Eng-52. $12.30(ph OTS); $4.50(mf OTS).

Attached to this report is a copy, INVESTIGATION OF HIGH DENSITY CONCRETES, which was prepared for the Atomic Energy Commission by the North Pacific Division Lab., Corp. of Engineers, Troutdale, Oregon. 51p.

A series of tests conducted to determine the physical properties of several types of high-density concretes and mortars made primarily with magnetite, and/or limonite aggregates are described. The results are analyzed and evaluated. (T.R.H.)

2419 HW-33023
Hanford Atomic Products Operation, Richland, Wash.
THE TREATMENT OF WOOD CONTAINERS TO RESIST FIRE. A. E. Engler. Sept. 10, 1954. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 15p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Methods available for reducing the flammability of wood to be used for U containers were studied. Vacuum-pressure treatment with chromated zinc chloride appears to be satisfactory. (F.S.)

2420 ISC-605
Ames Lab., Ames, Iowa.
QUARTERLY SUMMARY RESEARCH REPORT IN ENGINEERING FOR JANUARY, FEBRUARY, MARCH 1955. June 25, 1955. Decl. Jan. 6, 1956. 14p. Contract W-7405-eng-82. $3.30(ph OTS); $2.40(mf OTS).

Equilibrium data have been determined for the rare earth nitrate–water–nitric acid–TBP systems. The production of Zr by the reduction of ZrF_4 with Mg is being studied. The surface tension of Ce and La and their wetting of refractory oxides were investigated. The circulation of Bi–U alloys in the Th–Mg loop was described. (C.W.H.)

2421 KAPL-585
Knolls Atomic Power Lab., Schenectady, N. Y.
FIRST INTERIM REPORT ON DURABILITY AND SEAT LEAKAGE TESTS ON LIQUID METAL VALVES. Harold J. Balhouse. Aug. 3, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 61p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

Tests were conducted to determine the general durability and seat leak-tightness of commercially available valves operating in liquid Na at temperatures of approximately 650°F. (J.E.D.)

2422 KAPL-589

Knolls Atomic Power Lab., Schenectady, N. Y.

COMPATIBILITY OF MATERIALS IN LIQUID METAL. Donald B. Vail. Aug. 18, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 103p. Contract W-31-109-Eng-52. $16.80(ph OTS); $5.70(mf OTS).

A series of tests were initiated to determine the materials which are best suited for use as Na- or NaK-lubricated bearings under conditions of boundary lubrication. In order to evaluate the compatibility of materials for use in slider, hydraulic piston, or anti-friction bearings a compatibility tester was designed. The specimens constructed of similar or dissimilar materials are of two types. The sleeve specimen is rotated against a fixed specimen to which a known load is applied. A variety of materials have been evaluated under a limited set of conditions. Of the materials tested, exceedingly hard materials and Al alloys gave the best results. (F.S.)

2423 KAPL-M-WMK-2

Knolls Atomic Power Lab., Schenectady, N. Y.

PRESSURE RISE IN A CONFINED VOLUME OF MOLTEN SODIUM UPON ADDITION OF HEAT. W. M. Knox. May 20, 1953. 7p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The increase of pressure in a confined volume of molten Na is determined for a few representative cases. Assuming a rigid container which is initially completely filled with a homogeneous mass of Na, the results indicate that an increase in the temperature of the liquid from 300 to approximately 1000°F will be accompanied by a pressure rise of the order of 10^4 psi. The results obtained are considered to have limited practical significance since it would be difficult to satisfy the assumptions given above. Whenever adequate venting is not provided a more detailed analysis is recommended. (auth)

Refer also to abstract 2703.

HEAT TRANSFER AND FLUID FLOW

2424 AECU-3230

Sandia Corp., Albuquerque, N. Mex.

ONE-DIMENSIONAL COMPRESSIBLE FLOWS OF MAGNETO-HYDRODYNAMICS. O. G. Owens. Sept. 23, 1955. 16p. (TM-214-55-51). $3.30(ph OTS); $2.40 (mf OTS).

The systematic description of the physical state of electrically conducting fluid-like media (liquids, gases) is the concern of magnetohydrodynamics. For such an incompressible media, explicit one-dimensional plane wave solutions have been obtained. Here the problem is reinvestigated but now the assumption of incompressibility is not necessarily retained. By a constructive process, all simple wave solutions of this generalized problem are determined. The method is essentially free of difficulties, once the basic non-linear, ordinary-differential equation of the theory has been integrated. (auth)

2425 AECU-3241

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

PRESSURE DROP IN TEES. J. D. Roarty, A. A. Aykanian, and D. C. Lea. Sept. 30, 1950. 33p. For Carbide and Carbon Chemicals Div., K-25 Plant. Contract [W-7405-eng-26, Subcontract 70]. (KT-90). $6.30(ph OTS); $3.00 (mf OTS).

An investigation was made of pressure drops for various flow configurations in pipe tees. The equipment used consisted primarily of ¾-in. Cu tubing. The fluid used was H_2O. Resistance coefficients were determined for branch flows, and an attempt was made to correlate the data for pressure drops in various configurations. (D.E.B.)

2426 AECU-3242

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

THE RESPONSE TIME OF SMALL PITOT TUBES. H. L. Weissberg. Oct. 19, 1953. 6p. Contract [W-7405-eng-26]. (KLI-2616). $1.80(ph OTS); $1.80(mf OTS).

An equation is derived from which one can determine for a given pitot tube and manometer, the time necessary for the pressure in the manometer to become sufficiently close to the pressure at the mouth of the pitot tube. The equation can be used to determine a lower limit for the radius of pitot tubes in order to obtain manometer readings in a reasonable length of time. (auth)

2427 CF-54-6-210

Oak Ridge National Lab., Tenn.

VELOCITY DISTRIBUTION OF FLOW THROUGH 90° ELBOWS. P. H. Harley. June 29, 1954. 6p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Vaned single mitered elbows are recommended for the most uniform velocity distribution at less than 20 pipe diameters downstream. Six types of 90° elbows were studied. (F.S.)

2428 CF-54-7-115

Oak Ridge National Lab., Tenn.

CONTRIBUTION OF RADIOACTIVE FISSION PRODUCTS TO HEAT TRANSFERRED IN COLD TRAP. P. N. Haubenreich and T. W. Leland. July 20, 1954. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A cold trap has been designed to remove D_2O from the gas stream leaving the recombiner. The energy increase of the gas in the trap and the trap walls as a result of fission products in the stream has been estimated. The calculation methods are described and the results summarized. (F.S.)

2429 CF-54-11-122

Oak Ridge National Lab., Tenn.

THERMODYNAMIC PROPERTIES AND RELATIONS FOR SOLVING EQUATION FOR HEAT TRANSFER INSIDE TUBES AND EQUATIONS FOR PRESSURE DROP THROUGH TUBES FOR D_2O AND SOLUTIONS OF UO_2SO_4 IN D_2O, TBR MEMO NO. 7. A. L. Gaines. Nov. 12, 1954. 29p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

In connection with the design of the Thorium Breeder Reactor, data were compiled to cover the thermal conductivity, viscosity, specific heat, and certain relations for solving the pressure drop and heat transfer coefficient equations for flow of $UO_2SO_4-D_2O$ solutions inside circular channels. (B.J.H.)

2430 CF-55-4-182

Oak Ridge National Lab., Tenn.

THE RHEOLOGY OF THORIUM OXIDE SLURRIES. [Report No]. I. P. R. Crowley and D. G. Thomas. Apr. 20, 1955. Decl. Feb. 9, 1956. 17p. Contract [W-7405-eng-26]. $0.20(OTS).

An understanding of the rheology of ThO_2 slurries is of immediate importance in predicting the conventional equipment performance and analyzing test results for the HRT slurry blanket. Present data indicate that oxide slurries at room temperature and concentrations of interest are non Newtonian. The flow of ThO_2 slurries through pipes is discussed. (W.L.H.)

2431 CF-55-5-62

Oak Ridge National Lab., Tenn.

EXPERIMENTAL DETERMINATION OF FLOW THROUGH

HOLES IN SIMULATED MTR END BOXES. J. P. Sanders. May 5, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 30p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Holes have been cut in the lower end boxes of MTR fuel elements in order to redistribute the flow between the end box and the channels surrounding the end box. A lucite model has been made to simulate these flow channels, and a correlation has been made between the flow through holes connecting these channels and pressure differentials between the channels. The flow rate in each of the channels was calibrated as a function of a measurable pressure differential. After calibration the flow through holes interconnecting the channels was determined at various combinations of pressure and velocity differences in the channels. The average static pressure in the system did not influence the flow through the ½-inch-diameter holes; however, increased velocity in either the channel representing the flow inside the end box or the channel representing the flow outside the end box caused a decrease in the amount of water transferred through the hole for any given pressure drop. Velocity increases in the smaller channel representing the flow between end boxes had a greater effect in this respect. (auth)

2432 IDO-16311

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

TEMPERATURE DISTRIBUTION IN A FUEL PLATE WITH EXPONENTIALLY RISING POWER. PART II. RESULTS BASED ON ASYMPTOTIC SOLUTIONS. H. L. McMurry and A. V. Grimaud. Jan. 5, 1955. 12p. Contract AT(10-1)-205. (PPC-2). $3.30(ph OTS); $2.40(mf OTS).

See IDO-16214 (PPC-1) for Part I of this report.

The equation for the temperature distribution of a fuel plate infinite in two directions with a fuel layer clad on each face with an Al layer was obtained. The solutions assume an exponential temperature rise and the same thermal conductivity and heat capacity in the fuel layer and the Al layer. (F.S.)

2433 K-792

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

THE EFFECTS OF INVENTORY ON FREON 114 BOILING COEFFICIENTS IN EXPERIMENTAL BENT TUBE EVAPORATOR. F. A. Heilman and H. W. Dixon. July 31, 1951. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 16p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Data were obtained for Freon-114 boiling coefficients as a function of temperature difference for ⅛" tube, with three different inventory levels as parameters. Several runs were made at low and high condensing temperatures. When plotted as heat transfer coefficients versus ΔT on logarithmic coordinates, the curves show that, in the range of these tests the coefficients increase with increase of inventory; after peak point has been reached, increasing ΔT to the limit of stable operation of the loop continued to decrease heat-transfer coefficients; operating pressure has little if any effect on the coefficients; the liquid-vapor ratio is affected noticeably by liquid head only at ΔT's in the nucleate boiling range; and the test gave good reproducibility and the results agree with previous tests made on the apparatus. (auth)

2434 KAPL-M-CDB-3

[Knolls Atomic Power Lab., Schenectady, N. Y.]

SECOND REPORT ON CONVECTION CURRENTS IN THE FUEL SLUG. C. D. Best. APPENDIX A. MODEL LAWS FOR FUEL MIGRATION EXPERIMENT. R. C. Martinelli. Jan. 19, 1948. Decl. Feb. 7, 1956. 17p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Materials for the fluid and the spacers which had a conductivity ratio similar to the fuel slug were used to find the temperature distribution which was found to be in close agreement with the calculated value. There was no visible indication of fuel migration in the test run for several hours. (F.S.)

2435 KAPL-M-DPT-8

Knolls Atomic Power Lab., Schenectady, N. Y.

FREE CONVECTION IN NARROW VERTICAL LIQUID METAL ANNULI. D. P. Timo. Mar. 11, 1955. 30p. Contract W-31-109-Eng-52. $0.25(OTS).

An engineering approach to the solution of a troublesome free-convection problem in the narrow vertical sodium annuli of the SIR Mark A rotating plugs is presented. Very high heat transfer rates (in the order of 2000 Btu/hr/ft of periphery) were observed in annuli approximately 0.1 inch wide, 30 inches high, and of varying diameters, with vertical ΔT's of the order of 200°F. An approximate analysis of the heat transfer in these annuli is made. An expression giving the heat transfer due to free convection in a narrow annulus is derived, and a simple relationship between the Nusselt, Grashof, and Prandtl Numbers is obtained. The effectiveness of peripheral flow barriers or "piston rings" in reducing free-convection heat transfer in an annulus at higher ΔT's is conservatively evaluated. Preliminary experimental results provide a rough check on the analysis. This analysis, while made specifically for the case of convecting sodium, is applicable to other fluids, if film thermal resistances are taken into account. (auth)

2436 KAPL-M-JHG-3

Knolls Atomic Power Lab., Schenectady, N. Y.

THE EFFECT OF A LIQUID-FILLED ANNULUS UPON THE MECHANICAL RESPONSE OF A SYSTEM. J. H. Germer. June 18, 1953. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A method is given for analyzing the effect of narrow spaces filled with liquid upon the vibration and shock characteristics of structures. Both damping and inertia effects of the liquid are discussed. It is hoped that experiments will confirm this analysis. (auth)

2437 KAPL-M-LBV-5

Knolls Atomic Power Lab., Schenectady, N. Y.

ELECTROMAGNETIC PRESSURE GAGE. L. B. Vandenberg and G. P. Hendricks. July 18, 1952. 10p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Development is described of a pressure gage for use with electromagnetic liquid metal pumps in which the current necessary to maintain equal and opposing force is proportional to the applied pressure to be measured. The pressures are maintained equal and opposite by means of an automatic liquid metal rheostat. A schematic sketch of the apparatus is included. (C.H.)

2438 KAPL-M-LFE-16

Knolls Atomic Power Lab., Schenectady, N. Y.

AN OBJECTIVE STUDY OF BARRIER MATERIALS FOR SODIUM–WATER SYSTEMS. Leo F. Epstein. Nov. 17, 1955. 49p. Contract W-31-109-Eng-52. $0.35(OTS).

The question of the choice of barrier materials for stainless steel heat exchangers using Na as a heat transfer fluid is discussed. (F.S.)

2439 KAPL-M-PF-4

Knolls Atomic Power Lab., Schenectady, N. Y.

FORCED CONVECTION FLOW IN OPEN-ENDED ANNULUS. J. P. Fraser. Nov. 12, 1953. 15p. Contract W-31-109-Eng-52. $3.30(pn OTS); $2.40(mf OTS).

A roughly sinusoidal pressure distribution has been measured around the circumferences of the top and bottom plenums of the ½-scale flow model of Mark A. The low pressure points occur in both plenums near pipe connections. The top rotating plugs contain two annuli (between container, concentric plug and eccentric plug) which are open to the top plenum near its circumference. The outer thermal shield contains annuli which were open to the bottom plenum before design changes were initiated to close off these annuli. The nature of the flow field induced a typical Mark A annulus, closed at one end and open at the other to a plenum static pressure varying in a roughly sinusoidal manner in two waves about the circumference, is investigated herein. Annuli opening into the bottom plenum and the top plenum should be closed to prevent annular induced flow due to plenum pressure variation. (auth)

2440 KAPL-M-RGK-12
Knolls Atomic Power Lab., Schenectady, N. Y.
SURFACE ROUGHNESS CRITERIA FOR SMOOTH PIPE FLOW. R. G. Kennison. Jan. 15, 1953. 17p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Calculations are made to predict the variation of Reynolds number with G.E. surface finish at which the transition from smooth pipe to completely turbulent flow occurs. The variation of boundary layer thickness in a conical convergence is analyzed and found to vary as the ⅗ power of the distance ratio. (auth)

2441 KAPL-M-RGK-17
Knolls Atomic Power Lab., Schenectady, N. Y.
PRESSURE RESONANCE IN FLUID-FILLED CAVITIES. R. G. Kennison. [nd]. 23p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

An analysis is made of the transient pressures occurring in a fluid filled cavity connected by means of a restricted opening to a system in which a pressure variation occurs. The cases of a sustained oscillation in system pressure and a surge in system pressure are considered. The effects of a linearly compressible fluid and a perfect gas filling the cavity are compared. It is found that pressure variations may occur in the container which are many times greater than those in the system. These variations occur at a lower frequency when gas fills the cavity than when a liquid fills the cavity. (auth)

2442 KAPL-M-WWK-5
Knolls Atomic Power Lab., Schenectady, N. Y.
REMOVING THE SODIUM RESIDUE FROM THE ALPLAUS MAIN HEAT TRANSFER SYSTEM WITH ETHYLENE GLYCOL. W. W. Kendall and M. Nazar. Aug. 5, 1954. 21p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.40 (mf OTS).

The Na residues were cleaned from the Main Alplaus Heat Transfer System to remove all Na from the system for base shut down and, to demonstrate the use of ethylene glycol in cleaning a large scale system. The latter objective is in support of the program for developing a non-Na flushing agent for use in the Mark B Coolant System. All residual Na was cleaned from the system. Slight traces of C was found on the inside of the pipe by wiping with a white cloth. The decomposition of the glycol caused operational difficulties such that ethylene glycol cannot be recommended as the non-Na flush for Mark B. (auth)

Refer also to abstracts 2264 and 2729.

MATERIALS TESTING

2443 A-3344
Allis-Chalmers Mfg. Co., Milwaukee.
THREAD INVESTIGATION. Closing Report on Hawley Development Project No. 74. July 25, 1944. Decl. Jan. 18, 1956. Includes Supplement on Project 74-A and B. G. [S.] Fritsch. Aug. 28, 1944. 32p. Contract W-7405-eng-63. $6.30(ph OTS); $3.00(mf OTS).

Results of a series of Max-torque tests of threaded bolts, studs and nuts are cited. Tabular and graphic data include bolting strengths and thread damage as determined by these procedures. (T.W.S.)

2444 AECU-3315
[Sandia Corp., Albuquerque, N. Mex.]
PLASTISOL MOLDS FOR PLASTIC CASTINGS. E. R. Frye. Sept. 21, 1955. 11p. (TM-204-55-16). $1.80 (ph OTS); $1.80(mf OTS).

The process of casting plastics in plastisol molds is described. Accuracy limitations are defined, and application to prototype work is illustrated. (auth)

2445 IDO-16308
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
HYDRAULIC TESTS IN THE MTR LATTICE. T. R. Wilson, Jr., and O. J. Elgert, eds. Nov. 15, 1954. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 16p. Contract AT(10-1)-205. (MTRL-54-107). $3.30(ph OTS); $2.40(mf OTS).

IDO-16267 supplements this report.

In hydraulic tests in lattices to detect changes in the coolant flow or pressure which could have aggravated fuel element failures caused by an overheated and badly corroded zone, it was found that a 40-psig pressure differential across the reactor resulted in buckling of the lower section of fuel element and the coolant velocity was below specifications. Modification of the present fuel assemblies by drilling eight ½-in. holes in the lower end box of each assembly reduces the severity of buckling. (F.S.)

2446 KAPL-521
Knolls Atomic Power Lab., Schenectady, N. Y.
LIFE TEST OF LIQUID METAL LUBRICATED THRUST BEARING. D. B. Vail. May 7, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 17p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Results are given of a life test of 2700 hours duration performed on a liquid metal lubricated thrust bearing. Detailed procedures for life testing are included. (J.H.M.)

2447 KAPL-1021
Knolls Atomic Power Lab., Schenectady, N. Y.
COMPATIBILITY OF MATERIALS IN LIQUID METAL; SECOND REPORT. D. B. Vail. Jan. 5, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 69p. Contract W-31-109-Eng-52. $10.80(ph OTS); $3.90(mf OTS).

Studies previously reported are extended to include a larger selection of pairs of materials and to determine the effect of temperatures up to 950°F upon the compatibility of materials. It was concluded that at a temperature of approximately 850°F and at a liquid metal ambient certain combinations of ceramals (ceramic plus metallic binder) showed negligible wear or surface damage and no apparent transfer of material. At lower temperatures, some combinations of nonmetallic materials, metallic materials, and ceramals indicated satisfactory compatibility characteristics during boundary lubrication. (auth)

2448 KAPL-1079
Knolls Atomic Power Lab., Schenectady, N. Y.
THE PERFORMANCE OF TUNGSTEN CARBIDE JOURNAL BEARINGS OPERATING IN LIQUID METALS. D. B. Vail. Jan. 25, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 49p. Contract W-31-109-Eng-52. $7.80 (ph OTS); $3.30(mf OTS).

The results of a series of tests indicated that liquid-

metal-lubricated journal bearing performance may be predicted adequately by existing theoretical and empirical concepts. Test performance of the journal bearings was closely correlated with the theoretical performance postulated by Cameron and Wood for a full journal bearing. The calculated minimum film thicknesses were also shown to be as empirically postulated by Cameron. In the range of boundary lubrication it was observed that tungsten carbide ceramal bearings resisted the immediate seizure characteristics shown by other alloys, but that some roughening of the bearing surfaces occurred for the particular ceramals used in this series of tests. (auth)

2449 KAPL-M-JJM-1

Knolls Atomic Power Lab., Schenectady, N. Y.

AN INVESTIGATION OF ELECTROMAGNETIC PUMP FAILURES. J. J. Marguin. May 3, 1954. 14p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

An investigation is presented on the unusual number of small AC electromagnetic pump failures which have occurred in an attempt to make recommendations with regard to design changes in the pumps and to establish a proper mounting and operating procedure for using the pumps. (auth)

2450 KAPL-M-JZ-2

Knolls Atomic Power Lab., Schenectady, N. Y.

STRESSES CAUSED BY A STEP IN A CYLINDRICAL SHELL. John Zickel. June 15, 1953. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The effect of a longitudinal and a transverse force on a thin walled cylindrical shell with a built in step for reactor structures is discussed, disregarding stress concentrations from fillets and holes. (F.S.)

2451 KAPL-M-KDL-1

Knolls Atomic Power Lab., Schenectady, N. Y.

ANALYSIS OF THE SODIUM AND WATER PERFORMANCE OF THE ATWOOD-MORRILL SWING CHECK VALVE. K. D. Lantz and D. B. Vail. Mar. 19, 1953. 31p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70 (mf OTS).

The Atwood and Morrill swing check valve was tested for Na flow and for water flow under a variety of conditions. An analysis was made to determine the effects of friction and valve inclination upon the Na flow rate required to close the valve. Recommendations are made which may minimize the flow rate required to close this type of valve design. (C.H.)

2452 KAPL-M-RFK-5

Knolls Atomic Power Lab., Schenectady, N. Y.

EVALUATION OF METHODS OF PREVENTING THE GALLING OF STAINLESS STEEL THREADS IN SODIUM. R. F. Koenig. May 15, 1952. 5p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

The effectiveness of a number of lubricants and treatments in reducing the tendency of stainless steel threads to gall during exposure to Na was determined, using the torque required to loosen bolted assemblies as the criterion. Of the methods tested, only nitriding and carburizing were successful. Additional tests will be made of other methods of preventing galling, which are based on thread contour and clearances. (auth)

2453 TID-5187

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

MATERIALS FOR WATER-LUBRICATED BEARINGS. Final Report. H. B. Nudelman and G. H. Sump. Apr. 22, 1954. Changed from OFFICIAL USE ONLY July 30, 1956. 70p. For Westinghouse Electric Corp., Atomic Power Div. Contract AT-11-1-GEN-14, Subcontract 14-309, Task III. $10.80(ph OTS); $3.90(mf OTS).

The purpose of this investigation was the development of H_2O-lubricated bearing materials capable of performing at 200 to 500°F. Efforts were directed toward the correlation of wear technology with heated water bearing applications. Carbon bearing materials lack the high impact resistance and load carrying capacity of metallic materials. Bearing operation in the absence of a lubricating film might be adequate for carbon-to-metal components, but would be disastrous for metal-to-metal combinations. A metal-bonded carbon composite was developed to combine the desirable properties of carbon and metallic materials. This experimental bearing material performed successfully in both water-lubricated sleeve and thrust bearing applications. One of the stable fluorocarbons, polytetrafluoroethylene, was shown to be effective in reducing friction between metallic surfaces in heated water. A porous stainless steel skeleton was found to provide adequate support for this anti-friction material. Polytetrafluoroethylene-impregnated metal sleeve bearings have functioned successfully in heated water at loads up to 99 psi. (auth)

2454 WAPD-EM-17

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

A COMPARISON OF KEROSENE AND TRANSFORMER OIL AS CANNED ROTOR MOTOR COOLANTS. N. A. Petrick. Nov. 6, 1950. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 13p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

Tests were made comparing kerosene and transformer oil as canned rotor motor coolants. Results are given and indicate that kerosene is superior to transformer oil as a motor coolant. (J.H.M.)

2455 WAPD-EM-179

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].

SLEEVE BEARING TEST PROGRESS REPORT [FOR] JULY 1950 TO AUGUST 1952. Don Price and Eugene J. Cattabiani. Sept. 9, 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 54p. Contract [AT-11-1-GEN-14]. $9.30(ph OTS); $3.60(mf OTS).

For the purpose of selecting the best bearing material combinations for use in STR Primary Coolant Pumps, a Sleeve Bearing Test Program was initiated. A number of combinations were tested under controlled simulated operating conditions and performance for sufficient periods to establish the merit of that combination. The best material combination tested to date is a Graphitar 14 Bearing vs a Chrome Plated Journal. The next five good combinations in order of preference are (with the bearing material given first): Tungsten Carbide H-13 vs Tungsten Carbide T-66, Graphitar 14 vs Titanium Carbide T-77, Graphitar 14 vs Stellite 12, Graphitar 14 vs Stellite 1, and Graphitar 14 vs Stellite 98M2. In general, the harder journal materials and Graphitar 14 appear the most promising for use in 200°F water. (auth)

2456 WAPD-RM-131

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

AN INVESTIGATION OF INDUCED RADIOACTIVITY IN SOME MATERIALS CONSIDERED FOR IONIZATION CHAMBER CONSTRUCTION. H. S. McCreary, Jr. and Robert T. Bayard. June 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 12p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

To assist in the selection of materials for the construction of wide range neutron sensitive ionization chambers, measurements were made of the induced activities in

several promising materials. The criteria for selection are low induced activities and short half lives. Of the metallic samples irradiated, Dow Chemical Company Mg alloy 58135 seems most promising. Among the insulators, quartz, polystyrene, and nylon were found to be quite acceptable. (auth)

2457 WAPD-STR-L-724

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].

STRAIN INDICATIONS WITH BRITTLE COATINGS. Joseph V. Cupo. [1955?]. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 5p. $1.80(ph OTS); $1.80(mf OTS).

The brittle-lacquer method of strain indication is discussed, and the following steps in performing the strain analysis are included: selection of the appropriate lacquer for the expected test conditions, application of the lacquer to the test piece and calibrating strip , loading the test piece and observing cracks, loading the calibrating strip to determine the strain corresponding to incipient cracking, and dye etching for improved cracking visibility. (J.H.M.)

PUMPS

2458 CF-51-9-69

Oak Ridge National Lab., Tenn.

GAS FORMATION IN SUCTION LINE TO PULSAFEEDER. Leon Cooper. Sept. 7, 1951. Decl. Feb. 7, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations have been made to determine the amount of gas formation between the core and the ~ gpm pulsafeeder, and to determine the effect of this gas formation on the flow rate of the soup to the pulsafeeder. Two cases were considered where all the gas formed up to the vent before the pulsafeeder is vented, either through this vent or through the filter core vent, or where the vents could vent only ½ of the gas formed and the remainder of the gas remains with the liquid and is carried to the pulsafeeder. For each of the above cases, calculations were made for several rates of flow. A plot shows the percentage of gas and vapor as a function of the flow rate for both cases. (auth)

2459 CF-52-5-90

Oak Ridge National Lab., Tenn.

DESIGN OF A BELLOWS TYPE TRANSFER PUMP FOR THE BOILING HOMOGENEOUS REACTOR. J. D. Roarty. May 12, 1952. Decl. Feb. 7, 1956. 18p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Bellows-type and diaphragm pumps capable of handling enriched uranyl sulfate solutions for a boiling homogeneous reactor are described and analysed. (F.S.)

2460 CF-54-9-139

Oak Ridge National Lab., Tenn.

FEED PUMP OPERATING CHARACTERISTICS. E. Lloyd Youngblood. Sept. 10, 1954. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Operating data are presented for a Scott and Williams hydropulse hydraulic pump in conjunction with Lapp-type pulsafeeder heads. Tests indicate that the unit is capable of pumping 1.5 gal/min of H_2O at 200 psi. (C.W.H.)

2461 CF-54-9-139(Suppl.)

[Oak Ridge National Lab., Tenn.]

FEED PUMP OPERATING CHARACTERISTICS. E. Lloyd Youngblood. Oct. 5, 1954. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Additional operating data are presented for the Scott and Williams-type feed pumping unit. The effects of air addition on the pump output at feed water temperatures from 72 to 167°F were investigated. (C.W.H.)

2462 CF-54-11-184

Oak Ridge National Lab., Tenn.

PULSAFEEDER PUMP EXPERIMENTAL STRESS ANALYSIS. R. D. Cheverton. Nov. 22, 1954. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The stresses in the heads and the cylinder that joins the two heads in a pulsafeeder pump operating at 2000 psi were determined. (F.S.)

2463 CF-55-2-52

Oak Ridge National Lab., Tenn.

FEED PUMP MOCKUP. E. Lloyd Youngblood. Feb. 9, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The feed pump system of the HRT was studied using a Scott and Williams hydropulse pump driving to Lapp-type pulsafeeder heads. The effects of pressure drop in suction line, pump power demands, and the addition of air to pump suction are discussed relative to normal operating conditions. (T.W.S.)

2464 KAPL-M-LT-3

[Knolls Atomic Power Lab., Schenectady, N. Y.]

CALCULATIONS ON A D.C. ELECTROMAGNETIC PUMP. Lewi Tonks. June 16, 1948. Decl. Feb. 8, 1956. 10p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

An analysis was made of the electromechanics of a centrifugal d-c–actuated liquid metal pump. A uniform axial magnetic field assures constancy of angular velocity through the whirling chamber. A hyperbolic profile assures uniform radial velocity–which simplifies the mathematics slightly but has no essential advantage over constant height, except possibly in the power required to maintain the magnetic field. Such a pump is a very low impedance device, 10^4 to 10^5 mhos. It has a low efficiency because of the circular currents arising from the radial component of flow. A set of freely rotating insulating vanes could eliminate this power drain but would add mechanical complications. (auth)

2465 TID-5143

Allis-Chalmers Mfg. Co., Milwaukee.

DEVELOPMENT OF HERMETICALLY SEALED CENTRIFUGAL PUMP UNITS FOR LIQUID METALS. Final Report. Report No. 43-112. June 30, 1953. Changed from OFFICIAL USE ONLY Aug. 9, 1956. 307p. [For Knolls Atomic Power Lab.] Contract W-31-109-Eng-52. Subcontract No. 56.

Contains abridged translation by O. A. Schulze: "Outline of the Theory of Eddy Current Brakes" from the text "Energie der Wirbelstrome." R. Rüdenberg. 348p. $55.80(ph OTS); $11.10(mf OTS).

2466 WAPD-EM-56

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].

LARGE MODEL TEST PUMP (LMTP); TEST REPORT. J. D. Walls. Jan. 11, 1951. Changed from OFFICIAL USE ONLY July 18, 1956. 13p. $3.30(ph OTS); $2.40 (mf OTS).

2467 WAPD-EM-88

Westinghouse Electric Corp. Atomic Energy Div., Pittsburgh.

INSPECTION OF BYRON JACKSON 1800 RPM PUMP AFTER 580 HOURS OF OPERATION. E. A. Macha. Feb. 28, 1951. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 27p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

The pump was shut down after a total of 580 hours at 4000

gpm and 100 psi to inspect all wear surfaces. With the exception of a slight leak in the rotor can seam and scoring of the various wear rings the results of the inspection were favorable. Both the Graphitar runner and the thrust bearing shoes appeared to be in good condition. (F.S.)

VACUUM SYSTEMS

2468 KAPL-891
Knolls Atomic Power Lab., Schenectady, N. Y.
AN AUTOMATIC TWO-STAGE PUMP FOR TRANSFERRING GASES IN A VACUUM SYSTEM. O. N. Salmon. Nov. 11, 1953. Changed from OFFICIAL USE ONLY June 26, 1956. 20p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A two-stage Hg piston pump has been developed which will evacuate a vacuum system to a pressure less than 10^{-5} atm. against an outlet pressure of 0.7 to 1 atm. The distinguishing characteristics of the pump are its safe and reliable automatic operation over extended periods of time. (auth)

WASTE DISPOSAL

2469 AECD-4148
Mound Lab., Miamisburg, Ohio.
LIQUID WASTE DISPOSAL RESEARCH QUARTERLY REPORT FOR APRIL, MAY, AND JUNE 1950. July 1, 1950. Decl. with deletions Jan. 20, 1956. 32p. Contract AT-33-1-GEN-53. $6.30(ph OTS); $3.00(mf OTS).

Experiments have been carried out with both neutralized second-cycle wastes and pure isotopes which show that, in general, the presence of fluoride ion does not interfere with the removal of fission products from waste solutions. Analysis of a third sample of neutralized second-cycle wastes, whose estimated age was six months at the time the analysis was complete, shows that the rare earth elements are present in higher concentrations than any of the other fission products. In a single step the activity of this solution can be reduced from an initial value of 39,000 counts per minute per milliliter to 500 to 700 counts per minute per milliliter by precipitation with either ferrous sulfide or ferrous ferrocyanide. At the same time the alpha count if reduced from 150 counts per minute per milliliter to background. The percentage activity removal by ferrous sulfide is a function of the pH at which precipitation occurs. Nuchar 000 and manganese dioxide (formed both internally and externally) are better adsorbents for activity than silica gel or activated alumina. Upon subjection of the fresh reactor waste solutions to the adsorption, metal scrub, precipitation, and filteration scheme of processing, a reduction in activity was obtained of 39,000 to 250 to 300 counts per minute per milliliter. Silica gel and activated alumina were used in combination as adsorbents, iron powder was employed for the metal scrub, and ferrocyanide was used as the precipitant for ferrous ferrocyanide. The precipitate was first thickened in a small thickener then filtered on commercial filter cloth. It was found difficult to maintain the proper pH conditions in the adsorption column for maximum activity removal. The adsorbents appeared to possess a tremendous capacity for altering the solution. A small pilot model evaporator has been designed and constructed to obtain design data for a larger unit that is contemplated. This model was designed to minimize entrainment and foaming, the main problems encountered in the operation of a "Precision Laboratory Evaporator" in current use for concentrating the waste solutions from reactor waste treatment research. (auth)

2470 AECU-3244
Massachusetts Inst. of Tech., Oak Ridge, Tenn.
Engineering Practice School.
TEST OF STEAM JACKETED FALLING FILM EVAPORATOR. G. R. Nelson, T. F. Furlong, and J. B. Robinson. June 28, 1950. 11p. For Carbide and Carbon Chemicals Div., K-25 Plant. Contract [W-7405-eng-26, Subcontract 70]. (KT-76). $3.30(ph OTS); $2.40(mf OTS).

The results of a test to obtain operating data on a steam-heated falling-film evaporator for elimination of radioactive condensates the maximum practical steam pressure useable was 25 psig. The maximum flow of feed without flooding was about 0.2 lb/min. The maximum flow of feed for 10 psig steam pressure was 2 lb/min. Entrainment was encountered in all runs. The highest concentration obtained using 1.7% nitrate solution for feed was 38.4%. The average over-all heat transfer coefficient was found to be 386 ± 77 BTU/(hr)(sq ft). (F.S.)

2471 HW-21415 and Suppl.
Hanford Works, Richland, Wash.
A RECOMPUTATION AND EXTENSION OF PARAMETERS INVOLVED IN SUTTON'S DIFFUSION HYPOTHESIS. M. L. Barad and G. R. Hilst. June 19, 1951. Changed from OFFICIAL USE ONLY July 6, 1956. Supplement, Nov. 16, 1953. 37p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

Corrections of two errors in HW-21415 are presented. The original values of the virtual diffusion coefficients, C_z and C_y, for the neutral lapse conditions have been found to be in error, and corrected values are presented. In the computations of the original Table III an error was made and a corrected table is presented. (C.H.)

2472 KAPL-391
Knolls Atomic Power Lab., Schenectady, N. Y.
CONCENTRATION OF RADIOACTIVE LIQUID WASTE BY EVAPORATION. G. E. McCullough. Sept. 22, 1950. Changed from OFFICIAL USE ONLY June 26, 1956. 43p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

This report reviews the progress made since this facility has been in operation, explains how the service building is operated and why it is done this way, and provides a record for reference. In order to segregate and separate Redox wastes and to prepare them for storage and future treatment, five neutralizers have been provided. The neutralizer equipment, duplicated five times in various sizes, consists of a jacketed vessel equipped with an agitator or recirculating pump, a packed column, a condenser, and a receiving tank. The function of this equipment is to remove solvent from Redox waste solution by distillation. The overhead passes through the packed column and is condensed and collected. If the distillate contains the normal solvent used in the Redox Process, it is returned to that process. If there is any other solvent, it may be removed from the system. The material remaining in the neutralizer is adjusted to the proper pH and removed for storage and future treatment. Its concentration may also be adjusted by distillation or addition of water. (F.S.)

2473 WASH-149
Ames Lab., Ames, Iowa.
AIR CLEANING SEMINAR, AMES LABORATORY, SEPTEMBER 15-17, 1952. Mar. 1954. Changed from OFFICIAL USE ONLY June 22, 1956. 243p. $37.80(ph OTS); $11.10(mf OTS).

The papers presented at this seminar represent a broad attack upon all aspects of air and gas cleaning problems which confront the atomic energy industry. Topics dis-

cussed include the removal of soluble gases and particulates from air streams; the performance of reverse jet cloth filters; field studies of commercial dust-collector performance; electrostatically charged aerosol filters; wet cleaning investigations; dissolver off-gas filtration; efficiency of reverse-jet filters in U refining operations; removal of bacteria and bacteriophage from the air by glass fiber filters; deep-bed sand and glass fiber filters; the properties of aerosols; hygroscopic aerosols; the collection of aerosols on fiber mats; electrification of aerosols; solid waste disposal by incineration using tangential overfire air; the Argonne incinerator program; the performance of the Los Alamos incinerator effluent collector; and non-combustible and chemical-resistant air filters for high and low temperature use. An appendix contains an account of a round-table discussion of air sampling problems in AEC work, and requirements and specifications for sampling media. (C.H.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

2474 KAPL-849

Knolls Atomic Power Lab., Schenectady, N. Y.
THE KNOLLS ATOMIC POWER LABORATORY CERAMIC SEAL PROGRAM. P. J. Scavullo. Oct. 31, 1952. Changed from OFFICIAL USE ONLY June 26, 1956. 19p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Ceramics and ceramic-to-metal seals are being investigated for applications in (1) power lead and heater lead assemblies, and (2) terminations for mineral-insulated cables. Description is given of the MoO_3 process for metallizing the ceramic body to obtain a strong vacuum-tight bond between the metal and the ceramic. The test specifications for the seals are discussed, both for power-lead and heater-lead assemblies and for mineral-insulated cable terminations. The designs that have passed all the tests are shown and described. (L.M.T.)

2475 KAPL-1177

Knolls Atomic Power Lab., Schenectady, N. Y.
CERAMIC INSULATION FOR ELECTROMAGNETIC PUMP COILS. H. G. Sowman and C. W. Krystyniak. June 1, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 26p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

A unique method of electrically insulating coils of an electromagnetic pump is described. Glass coatings on the Cu conductors were used as a means of turn-to-turn insulation. The insulation was composed of inorganic materials only. Successful tests were carried out at coil temperatures of approximately 500°C. Electrical resistances were found to be adequate and the thermal shock properties excellent. In addition, the glass coating provided considerable protection against oxidation for the copper conductors. (auth)

2476 KAPL-M-LFC-3

Knolls Atomic Power Lab., Schenectady, N. Y.
A NOTE ON CEMENTED TUNGSTEN CARBIDE AS A BEARING MATERIAL. L. F. Coffin, Jr. July 28, 1952. Decl. Feb. 7, 1956. 10p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

The selection of a bearing metal to be mated with cemented tungsten carbide should be determined principally on the basis of the solubility of the metal in the cemented carbide. Solubility is affected by the cementing agent used in the bonding process, and depends on its state in the structure (that is, whether it is free form, or in solution, or in intermetallic form). The degree of solubility is shown to correlate with wear and surface damage, and with the sticking temperatures found experimentally by Dawihl. The superior wear resistance of cobalt bonded tungsten carbide–titanium carbide mixtures against steel is explained on the basis of the state of Co in the compound, and the low solubility of titanium carbide in Fe. (auth)

2477 KAPL-M-LFC-7

Knolls Atomic Power Lab., Schenectady, N. Y.
A NOTE ON ALUMINUM OXIDE AS A BEARING MATERIAL. L. F. Coffin, Jr. Feb. 17, 1954. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Aluminum oxide shows good corrosion resistance to Na and water. Because of its hardness, high melting point and strength it has possibilities for use in bearings exposed to these fluids. Low surface roughness is extremely important and for this reason single crystal aluminum oxide (sapphire) is better suited for bearings than polycrystalline material. Since Na and water are not particularly effective in reducing surface adhesion between solids, for successful bearing operation, only those materials which exhibit a low work of adhesion with aluminum oxide should be used. These include Fe, Ni, and Co. Since most oxides interact, metallic oxides should exhibit high adhesion in contact with Al_2O_3. Thus oxidizing atmospheres should be avioded when using the above metals. On the other hand, by using a noble metal such as Au, the problem of oxide formation and high adhesion can be avoided. No information is available concerning the use of other refractory materials such as the carbides and nitrides with aluminum oxide. (auth)

CORROSION

2478 HW-33504

Hanford Atomic Products Operation, Richland, Wash.
CATHODIC PROTECTION OF STAINLESS STEEL WASTE LINES. INTERIM REPORT NO. 1. UNDERGROUND PIPELINE AND STRUCTURE CORROSION STUDY PROGRAM. R. T. Jaske. Nov. 15, 1954. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 26p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

The practical aspects of cathodic protection of stainless steel waste lines are demonstrated. (T.R.H.)

2479 HW-33911

Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF SOIL CORROSION AT HANFORD ATOMIC PRODUCTS OPERATION. SUMMARY REPORT—UNDERGROUND PIPELINE AND STRUCTURE CORROSION STUDY PROGRAM. R. T. Jaske. Apr. 15, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 61p. Contract [W-31-109-Eng-52]. $10.80(ph OTS); $3.90(mf OTS).

The corrosion of stainless steel, cast iron, and galvanized steel pipes by soil conditions is summarized. The use of cathodic protection for stainless steel pipe is recommended. Other similar recommendations are offered. (T.R.H.)

2480 HW-3-2898

Hanford Works, Richland, Wash.
CORROSION STUDIES ON 25-12 AND 18-8 STAINLESS STEEL. Memorandum Report SE-PC No. 70. E. H. Turk. July 21, 1945. Decl. Jan. 7, 1956. 6p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Rates of corrosion of 25-12 Nb and 18-8 Nb steel in

various acid media were determined. The presence of 0.4 to 1% of tributylamine or diamylamine in 60% boiling HNO_3 decreased the corrosion rate of 25-12 Nb steel, particularly on repeated exposures with fresh solutions. Chromate has an inhibiting effect on the corrosion of 25-12 Nb steel by $NH_4F \cdot HF$. Systems such as 10% NH_4HF_2–5% $Na_2CrO_4 \cdot 4H_2O$ which might be beneficial for decontaminating the $BiPO_4$ extraction cake by the washing technique are safely below the permissible corrosion limit. Nitric acid (1.4N) process solutions containing 0.05M fluomolybdic acid or 0.05M fluotitanic acid were found to have essentially the same corrosion effects on 25-12 Nb steel as a comparable process solution containing 0.05M fluosilicic acid. (auth)

2481 KAPL-M-EGB-4
Knolls Atomic Power Lab., Schenectady, N. Y.
ALPLAUS SURVEILLANCE PROGRAM. Progress Report No. 2. E. G. Brush. Aug. 29, 1952. Changed from OFFICIAL USE ONLY June 26, 1956. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Type-347 stainless steel and L nickel, considered as construction materials in the Alplaus heat-transfer system, were placed in the system to determine their corrosion resistance to liquid Na and NaK. The specimens were very resistant to attack by Na at 950°F and NaK at 850°F. There was no evidence of mass transfer between the stainless steel and Ni specimens. No transfer of mass from the hot to the cold zones occurred in one year. (D.E.B.)

2482 KAPL-M-GEG-4
Knolls Atomic Power Lab., Schenectady, N. Y.
EFFECT OF RADIATION ON THE CORROSION OF METALLIC MATERIALS IN 580°F WATER. G. E. Galonian, E. J. Callahan, and R. F. Koenig. Nov. 11, 1955. Decl. Sept. 24, 1956. 21p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

To determine the effects of irradiation on the corrosion behavior of structural, fuel-cladding and poison materials, a series of in-pile corrosion tests is being made. This report describes the results of a three-months dynamic test made in 580°F water in the KAPL-120 water loop in the H pile at Hanford. The corrosion results show that an apparent decrease in corrosion occurs with increasing Cr content in Fe-base alloys, both in-pile and out-of-pile. The corrosion resistance of stainless steels, Zircaloy-2, and Hf was unaffected by the radiation. (auth)

2483 KAPL-M-UM-4
Knolls Atomic Power Lab., Schenectady, N. Y.
INTERIM REPORT ON THE CORROSION BEHAVIOR OF SOME BORON CONTAINING MATERIALS IN HIGH TEMPERATURE WATER. Donald C. Belouin and Ulrich Merten. Sept. 9, 1955. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The corrosion resistance of stainless steel–boron, Ti–B, and Zr–B alloys to H_2O at 600°F was investigated. Boron powder dispersions were also corrosion tested. (C.W.H.)

2484 LA-1355
Los Alamos Scientific Lab., N. Mex.
STATISTICAL ANALYSIS OF THE CORROSION OF URANIUM. PART I. TESTS IN MOIST HELIUM AND THE EFFECTS OF IMPURITIES. James T. Waber. Jan. 31, 1952. Decl. May 22, 1956. 23p. Contract W-7405-eng-36. $0.25(OTS).

Rate data concerning the corrosion of U have been treated statistically. A partial analysis of the effect of impurities has been made. The methods and equations are briefly explained. Rate constants and time dependences of the corrosion reaction, represented by a general equation $w = kt^m$ have been obtained. The data were plotted on log-log paper and the line of regression used. Only data for exposure to moist helium have been dealt with in this report. (auth)

2485 LA-1577
Los Alamos Scientific Lab., N. Mex.
STATISTICAL ANALYSIS OF THE CORROSION OF URANIUM. PART II. EFFECTS OF ROLLING AND ALPHA ANNEALING ON URANIUM EXPOSED TO MOIST HELIUM. J. T. Waber. May 1952. Decl. Dec. 14, 1955. 34p. Contract W-7405-eng-36. $0.25(OTS).

A statistical study was made of possible effects of rolling practice (such as amount of cross rolling, temperature, etc.) and of recrystallization in the alpha range on the corrosion behavior of U in moist He. Both the rate constant and the time dependence were fitted to the experimental data for each run. The t- and F-type statistical tests were applied to the rate constants and time dependences to ascertain whether these derived constants were dependent upon the rolling practice. The effects of cross rolling were smaller than the experimental error. Recrystallization produced no significant effect. It appears that the large effects noted in the first report of this series are caused mainly by impurity content and are therefore probably not due to the fabrication practice. (auth)

2486 MCW-178
Mallinckrodt Chemical Works, St. Louis.
CORROSION OF GOLD ALLOYS IN HF–H_2O ATMOSPHERES AT HIGH TEMPERATURE. C. F. Ritchie. Apr. 6, 1949. Decl. Sept. 19, 1955. 5p. $1.80(ph OTS); $1.80 (mf OTS).

The corrosion of Au alloys by aqueous HF solutions at 1050°F was investigated. "Palau" (80 wt. % Au–20 wt. % Pd) showed good corrosion resistance to these solutions. (C.W.H.)

2487 WAPD-CP-287
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
EFFECT OF OXYGEN ON STR MATERIALS AT HIGH pH, PARTICULARLY CHROME PLATE. Hugh F. Beeghly. Feb. 15, 1954. Changed from OFFICIAL USE ONLY May 11, 1956. 10p. $1.80(ph OTS); $1.80(mf OTS).

One of the criteria for evaluating the feasibility of operating with a primary coolant at high pH in the STR system is the ability of structural materials to resist corrosion by the coolant. Of the STR structural materials, chrome plate appeared especially susceptible to attack when both the pH and the oxygen content of the coolant were high. Chrome plated 17-4 PH steel specimens were placed in M-4 loop during a series of runs at high pH with different oxygen levels to determine quantitatively the relation between the oxygen level of the coolant and corrosion of the plate, so that maximum permissible oxygen concentration could be specified. (auth)

2488 WAPD-FE-896
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE EFFECT OF COLD AND HOT DRAWING ON THE CORROSION RESISTANCE OF ZIRCALOY-2. H. J. Snyder. June 30, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 11p. $1.80(ph OTS); $1.80(mf OTS).

The effect of both cold and hot drawing on the corrosion resistance of Zircaloy-2 in steam at 750°F for a period of 86 days is discussed. The data presented indicate that neither 54% cold drawing or 54% hot drawing affects the corrosive weight gain of Zircaloy-2 in steam at 750°F. The average weight gain was determined to be 77 mg per square decimeter of surface area. Methods of restoring a standard

corrosion resistant surface to Zircaloy-2 subsequent to fabrication have also been investigated. Tests indicate that the removal of 0.004 in. from the surface by abrasion with a 100 grit emery cloth or by machining, and the removal of approximately 0.0003 in. by etching in an aqueous solution of 35% HNO_3 and 5% HF at 160°F, is adequate to remove the surface deposits accrued in fabrication and to restore Zircaloy-2 so that it exhibits a normal behavior in corrosion. (auth)

2489 WAPD-MM-713
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
REPORT OF OCTOBER 1954 MEETING OF THE ZIRCONIUM ALLOY CORROSION COMMITTEE. S. Kass. Nov. 30, 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 136p. Contract [AT-11-1-GEN-14]. $21.30(ph OTS); $6.90(mf OTS).

The development of new Zr alloys having mechanical properties and corrosion resistance superior to the corresponding properties of Zircaloy-2 is reported. Since the optimum properties are not likely to be found in any single alloy, the program was designed to yield information which will permit the choice of an alloy composition suitable for a given combination of desired properties. The factors affecting the corrosion of Zr and its alloys are reported. (auth)

METALS AND METALLURGY

2490 AECD-3743
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
ZIRCONIUM PURIFICATION PILOT PLANT. D. C. Lea, A. A. Aykanian, R. F. Abbanat, and W. H. Bowman. Sept. 12, 1950. Decl. June 28, 1956. 34p. For Carbide and Carbon Chemicals Div. [K-25 Plant. Contract W-7405-eng-26, Subcontract 70]. (KT-89). $6.30(ph OTS); $3.00(mf OTS).

The operation and operating conditions of a Zr purification pilot plant are discussed. (J.H.M.)

2491 AECD-4172
Tennessee Eastman Corp., Oak Ridge, Tenn.
ISOTOPIC EXAMINATION OF TANTALUM. A. E. Cameron and J. R. White. Jan. 18, 1946. Decl. Nov. 28, 1955. 3p. (B-6.460.10). $1.80(ph OTS); $1.80(mf OTS).

The spectrum of TaF_5 was observed when UF_6 was passed into a Ta metal ion source. An examination of the singly-charged ion spectrum set an upper limit of abundance for Ta isotopes of 0.0001 of the mass 181. The relative abundance of the singly-charged ions is given. (auth)

2492 AECU-3225
Sandia Corp., Albuquerque, N. Mex.
TRANSIT TIMES OF COMPRESSION SOUND WAVES THROUGH ALUMINUM PLATE. Grant Montgomery and R. S. Claassen. Jan. 23, 1953. 7p. (TM-8-53-51). $1.80(ph OTS); $1.80(mf OTS).

Two special limiting conditions on the velocity of compression waves through Al plates are infinite cross section and very small cross section. The experimental data reported here indicate that as the wave-length decreases, a given cross section begins to act as an infinite solid. (T.R.H.)

2493 ANL-FF-100t(Del.)
[Argonne National Lab., Lemont, Ill.]
NAVAL REACTOR MATERIALS TESTING DIVISION PROGRAM M-4—SECTION 5. M. F. Murphy. May 24, 1951. Decl. with deletions Dec. 9, 1955. 10p. Contract [W-31-109-eng-38]. $1.80(ph OTS); $1.80(mf OTS).

The effects of pile irradiation on the tensile properties of five Ni alloys are reported. (D.E.B.)

2494 BBC-1
Brush Beryllium Co., Cleveland.
FIN TUBE PROJECT PROGRESS REPORT FOR THE PERIOD MAY 5, 1947 TO JANUARY 31, 1948. D. T. Doll. Decl. Feb. 7, 1956. 59p. Contract AT-30-1-Gen-155. $9.30(ph OTS); $3.60(mf OTS).

A series of experiments were performed to obtain information relative to the behavior of Be powder when hot pressed to form tubular shapes. Six cylindrical tube runs were made, after which equipment was designed to fabricate tubes having four fins. Eight four-fin tube experiments were performed in which two different mold designs were used. A full length, completely satisfactory tube was not obtained. Sections of the tubes produced showed good surface detail and appeared to be sintered, however, pressure tests showed a varying degree of pressure tightness. Linear compression of the metal powder was not successful. The friction between the compression ram and the mold and core prevented ease of compacting. The metal powder tended to bridge and bind to the core and mold. The metal powder showed some tendency to allow with the steel core and mold at the sintering temperature. This effect reduced further the compatibility of the powder. The last five experiments reported used a new method of compression. A thin walled metal sheet was used as the containing member. The sheet was formed to the fin tube shape. A core was centered in the envelope and metal powder placed in the void. Compression of the powder was obtained by applying gas pressure to the outside of the metal envelope while evacuating the interior during the sintering period. Tubes made by this procedure appeared to be the most satisfactory. (auth)

2495 BBC-12
Brush Beryllium Co., Cleveland.
FIN TUBE PROJECT AND G. E. WASHER PROJECT PROGRESS REPORT FOR THE PERIOD APRIL 1 TO APRIL 30, 1948. D. T. Doll. Decl. Feb. 7, 1956. 40p. Contract AT-30-1-Gen-155. $6.30(ph OTS).

2496 BBC-37
Brush Beryllium Co., Cleveland.
FINNED TUBES, G. E. SHAPES, AND URANIUM–BERYLLIUM POWDER METALLURGY PROGRESS REPORT FOR THE PERIOD DECEMBER 1 THROUGH DECEMBER 31, 1948. C. G. Hoffman. Decl. Feb. 7, 1956. 29p. Contract AT-30-1-Gen-155. $4.80(ph OTS); $2.70(mf OTS).

Four finned tube runs were made, three to investigate sintering at higher pressures and one under standard pressures. Three tubes cracked and one was porous. The cracking was probably caused by having the core off center which developed uneven stresses. Porosity was caused by a power shutoff. Several discs were made by warm pressing a good grade Be powder at 425°C and 100 psi. The discs were then sintered with a load of 60 psi. Their quality was greatly improved. This may be attributed to the high purity powder used. A column of warm pressed washers were sintered in the same way but "mushed out" during sintering. Tri-fluted spacers were fabricated. The first was oversize and the second achieved a density of 1.842 but was bent. A mold and plunger with a clearance of 0.0025-in. were made and several solid warm pressed compacts, one with a steel core, were finished. The density was 1.841, and except for two small blisters they were satisfactory. One U–Be compact with a density of 2.188 was made and then sintered. After sintering at 1000°C, the density fell to 2.043. A second warm pressing increased the density to 2.15, but a second sintering reduced it to 2.14. (F.S.)

2497 BBC-48
Brush Beryllium Co., Cleveland.
MECHANICAL PROPERTIES OF BERYLLIUM METAL. I. HOT PRESSED POWDER. W. W. Beaver and B. C. Raynes. June 26, 1951. Changed from OFFICIAL USE ONLY Jan. 30, 1956. 49p. Contract AT-30-1-510. $7.80(ph OTS); $3.30(mf OTS).

The mechanical properties of hot pressed Be powder under tensional, compressional, double shear and tensional loading are presented. Additional work on impact and high-temperature properties is also reported. (W.L.H.)

2498 BRB-1
Bridgeport Brass Co., Conn.
FABRICATION OF ZIRCONIUM "S" ROD THIMBLE TUBES. R. M. Treco, G. T. Murray, and R. S. French. Jan. 1955. Changed from OFFICIAL USE ONLY June 15, 1956. 47p. Contract AT(30-1)-1405. $7.80(ph OTS); $3.30(mf OTS).

Experimental work in the extrusion, rocking, swaging, drawing, welding, and finishing of Zr and Zircaloy-2 is described. The detailed procedure for fabrication of long thin-walled Zr "S" Rod Thimble Tubes is given. (T.R.H.)

2499 BW-5413
Babcock and Wilcox Co. Research and Development Center, Alliance, Ohio.
DEVELOPMENT OF MANUAL WELDING PROCEDURE FOR A PRESSURE VESSEL CLOSURE. E. C. Plotter and M. H. Mackusick. June 11, 1952. Changed from OFFICIAL USE ONLY July 2, 1956. 100p. $16.80(ph OTS); $5.70(mf OTS).

This report covers the development of a satisfactory welding procedure for use in making a manual "closure" weld in a stainless clad pressure vessel in which all welding must be done from the outside of the vessel. The details of welding and investigation of weld quality of a number of flat test plates are described. Six weld-machining cycles on a special fixture of full size are also covered. The welding and examination of a full size welded "closure" joint in a test fixture, made under restricted space conditons simulating the final application, are described. Recommended welding procedure, operator qualification procedure and weld inspection procedure are appended. (auth)

2500 CF-53-7-167
Oak Ridge National Lab., Tenn.
AN OUTLINE OF ELECTROLYTIC DECONTAMINATION. J. A. McLaren. July 21, 1953. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Electrochemical decontamination by electropolishing at high current densities in concentrated electrolytes is rapid and complete. Anodic electrolysis in dilute acids at low current densities is comparatively slow but requires less reagent and smaller currents than electropolishing. Cathodic electrolysis or a combination of cathodic and anodic may be the best for some conditions. Electrolytic migration may be used to decontaminate resins, cloth and similar materials. Electrochemical cells may be used to form, regenerate, and remove radioactivity from a variety of solutions used for decontamination. (auth)

2501 COO-106
Graham, Crowley, and Associates, Inc., Jenkintown, Penna.
ELECTRODEPOSITION OF ZIRCONIUM. Progress Report No. 2 Covering Period February 1, 1952 to April 30, 1952. Changed from OFFICIAL USE ONLY June 22, 1956. 47p. Project No. J-132. Contract AT(11-1)-173. $7.80(ph OTS); $3.30(mf OTS).

Zirconium tetrachloride has been found to be appreciably soluble in acetonitrile and dimethyl formamide to form solutions which are conductive. These have been electrolyzed at current densities of 1, 5 and 10 amp./sq.dm. with platinum cathodes. The acetonitrile solutions were also electrolyzed with zirconium and mercury cathodes. No metallic deposits of zirconium were obtained. However, zirconium metal was found to function as a soluble anode in both of these electrolytes. The possible formation of an ionized complex of zirconium tetrachloride and lithium hydride or lithium aluminum hydride in ethyl ether was investigated. Similar studies are planned using tetrahydrofuran in the place of ethyl ether. (auth)

2502 COO-107
Graham, Crowley and Associates, Inc., Jenkintown, Penna.
ELECTRODEPOSITION OF ZIRCONIUM. Progress Report No. 3 Covering Period May 1, 1952 to July 31, 1952. Changed from OFFICIAL USE ONLY June 22, 1956. 29p. Project No. J-132. Contract AT(11-1)-173. $4.80(ph OTS); $2.70(mf OTS).

A number of organic liquids having relatively nonlabile H atoms were studied as possible solvents for $ZrCl_4$. Acetic anhydride and propionitrile were found to dissolve appreciable amounts of $ZrCl_4$ and form solutions which were sufficiently conductive for electrolysis. Solutions of $ZrCl_4$ in acetic anhydride, propionitrile and tetrahydrofuran were electrolyzed with Pt cathodes and Zr anodes over a range of cathode current densities. No weighable cathode deposits were obtained although, when the cathodes were analyzed qualitatively, trace tests indicating the presence of Zr in some form were obtained. Studies involving the possible electrodeposition of Zr metal from ternary systems of the Plotnikov type have been initiated. These systems, in general, are comprised of a halide of the metal whose deposition is desired together with either an alkali metal halide or an Al halide in an organic constituent, such as, nitrobenzene, benzene, toluene, ethylbromide or ethylenebromide. Two of Plotnikov's electrolyses considered as representative of simple and difficult electrodepositions, Cu and K have been reproduced in our laboratory. To date, three conductive ternary systems of the above type containing a Zr halide as one of the constituents have been found and electrolyzed. No metallic deposits have been obtained from these. The systematic study of other ternary systems containing a Zr halide is now in progress. (auth)

2503 COO-110
Graham, Crowley and Associates, Inc., Jenkintown, Penna.
ELECTRODEPOSITION OF ZIRCONIUM. Progress Report No. 4 Covering Period August 1, 1952 to October 31, 1952. Changed from OFFICIAL USE ONLY June 22, 1956. 44p. Project No. J-132. Contract AT(11-1)-173. $7.80 (ph OTS); $3.30(mf OTS).

A literature review of ternary electrolyte systems of the "Plotnikov type" has shown that many metals, including Al and four of the alkali metals, have been electrodeposited from such systems. In general, these systems are comprised of a halide of the metal whose deposition is desired together with either an alkali metal halide or an Al halide in an organic constituent such as benzene, nitrobenzene, toluene, ethylbromide, or ethylenebromide. Solubility and conductivity studies of $ZrCl_4$ with aluminum chloride, bromide, or iodide in nitrobenzene and with aluminum chloride in para-xylene have been carried out. These studies have strongly suggested that comparable conductive complexes are formed with Zr_2Cl_4. A closed Pyrex glass electrolysis system was designed and built so that all the electrolyte components could be volatilized in anhydrous form directly into the electrolysis chamber in an atmosphere of dry nitrogen. The following three sys-

tems have been electrolyzed under these conditions: zirconium tetrachloride—aluminum chloride—para-xylene; zirconium tetrachloride—aluminum chloride—nitrobenzene, and zirconium tetrachloride—aluminum iodide—nitrobenzene. No weighable cathode deposits were obtained with the first two systems. Hard black cathode deposits which proved to contain Zr but no Al were obtained when the third system was electrolyzed. Gas evolution tests, however, failed to establish that metallic Zr was present. (auth)

2504 COO-111

Graham, Crowley and Associates, Inc., Jenkintown, Penna. ELECTRODEPOSITION OF ZIRCONIUM. Progress Report No. 5 Covering Period November 1, 1952 to January 31, 1953. Changed from OFFICIAL USE ONLY June 22, 1956. 30p. Project No. J-132. Contract AT(11-1)-173. $4.80(ph OTS) $2.70(mf OTS).

Conductive ternary zirconium complexes have been made with zirconium tetrachloride–ferric chloride–nitrobenzene and with zirconium tetrachloride–boron trifluoride–ethyl ether. These systems were developed in the course of examining a number of "Friedel-Craft" complexes in conjunction with zirconium tetrachloride. After electrolytic studies of the above have been carried out, other comparable systems will be similarly characterized. (auth)

2505 COO-180

Graham, Crowley and Associates, Inc., Jenkintown, Penna. ELECTRODEPOSITION OF ZIRCONIUM. Progress Report No. 6 Covering Period February 1, 1953 to April 15, 1953. Changed from OFFICIAL USE ONLY June 22, 1956. 26p. Project J-132. Contract AT(11-1)-173. $4.80(ph OTS); $2.70(mf OTS).

Conductivity studies were carried out in a number of non-aqueous systems with a view of finding conductive Zr complexes from which the metal could be electrodeposited. Conductive complexes were found to form in the following three systems: zirconium tetraiodide–nitrobenzene, zirconium tetraiodide–acetonitrile, and zirconium tetrachloride–pyridine. The latter two of these systems were electrolyzed. In both instances, weighable cathode deposits were obtained which upon analysis were found to contain Zr in a non-metallic form. Two additional non-aqueous systems which had been found to be conductive in previous work, were also electrolyzed. These were the systems, zirconium tetrachloride–boron trifluoride–ethyl ether and zirconium tetrachloride–ferric chloride–nitrobenzene. Again in both electrolyses, weighable cathode deposits were obtained which upon analysis proved to contain Zr in a non-metallic form. (auth)

2506 HW-20276

[Hanford Works, Richland, Wash.]. WESTINGHOUSE CREEP TEST OF ZIRCONIUM–WAPD-M-106; MEMORANDUM. L. M. Loeb. Feb. 12, 1951. Changed from OFFICIAL USE ONLY July 6, 1956. 20p. $7.80(ph OTS); $3.30(mf OTS).

A creep test is proposed for a Zr tensile specimen to be stressed to 800 psi at 260°C by means of a pressure loaded bellows. The elongation of the tensile rod will be measured by means of a variable differential transformer. The test mechanism is assembled into a water-tight slug charged into a water-cooled process tube. Photographs and a detailed drawing of the apparatus are shown. (F.S.)

2507 IDO-16281

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho. SPECIFICATIONS FOR FUEL ASSEMBLIES FOR MATERIALS TESTING REACTOR. R. M. Jones. July 13, 1955. 7p. Contract AT(10-1)-205. (PPC-219). $1.80(ph OTS); $1.80(mf OTS).

The dimensional specifications for the fabrication of fuel assemblies for the MTR are given. (F.S.)

2508 KAPL-113

Knolls Atomic Power Lab., Schenectady, N. Y. THE KAPL BERYLLIUM HOT PRESSING PROCESS. I. THE METHOD. A. U. Seybolt, R. M. Linsmayer, and J. P. Frandsen. Dec. 13, 1948. Changed from OFFICIAL USE ONLY Aug. 30, 1956. 29p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Beryllium hot pressed powder compacts of practically theoretical density have been made up to about 12 in. in diameter and 4 in. thick. Pressing conditions using a metal-lined graphite die have usually been the following: temperature, 1100°C; pressure, 750 to 1000 psi; time, at maximum temperature and pressure, 30 to 45 min. Radiographs show such Be to be quite uniform and structurally dense, a finding corroborated by metallographic examination. However there are numerous small flux inclusions and other inclusions, reflecting the lack of high purity in the raw material used. (auth)

2509 KAPL-M-EEB-13(Del.)

Knolls Atomic Power Lab., Schenectady, N. Y. TENSILE AND CREEP PROPERTIES OF 18-4-1 TOOL STEEL AND 414 STAINLESS STEEL. E. E. Baldwin. June 8, 1955. Decl. with deletions Apr. 1, 1956. 11p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Short-time tensile tests between room temperature and 538°C and creep tests at 538°C were conducted on samples of 18–4–1 tool steel quenched and double tempered at 649°C and type 414 stainless steel having a hardness of 40Rc. The results indicated that the 18–4–1 tool steel has higher tensile and creep strength and much lower ductility than the type 414 stainless steel. (auth)

2510 KAPL-M-WLF-2

Knolls Atomic Power Lab., Schenectady, N. Y. FRACTURE BEHAVIOR OF WELDED CARBON STEEL PLATE. A LITERATURE SURVEY AND A SUGGESTED TEST PROGRAM INVESTIGATING THE EFFECTIVENESS OF LOW TEMPERATURE TREATMENT TO OVERCOME SOME OF THE EMBRITTLING EFFECT. W. L. Fleischmann. May 15, 1952. 15p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The fact that welding embrittles carbon steel plate is indicated by the literature. Low's recent investigation explained this phenomenon as quench aging and suggests a low temperature treatment of around 650°F as a partial remedy. Since the reactor building is scheduled for erection during the cold months of the year, it might be desirable to have this low temperature treatment more thoroughly investigated in order that a process be worked out which in case of welding difficulties might overcome the detrimental effects of welding. (auth)

2511 NAA-SR-Memo-75

North American Aviation, Inc., [Downey, Calif.]. METAL–WATER EXPLOSIONS. W. C. Ruebsamen and J. B. Chrisney. July 10, 1951. Changed from OFFICIAL USE ONLY June 22, 1956. 8p. $1.80(ph OTS); $1.80(mf OTS).

The following were tested for explosive reactions with water: Al; Al–U alloys; Cu; Ni; U; U–Zr alloys; and Zr. Procedures followed included: furnace and induction heating of samples with water in sealed pyrex tubes; electrical (variable voltage a-c) heating of wires and foils under water; and condenser discharges through wires and foils. (T.W.S.)

2512 NYO-1025
Horizons Inc., Cleveland.
THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS. M. A. Steinberg. Oct. 26, 1949. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 114p. Contract AT(30-1)-696. $18.30(ph OTS); $6.00(mf OTS).

An investigation of the production of Zr by electrolysis of fused salt baths containing halides and double halides of Zr is presented. Data are included on electrolysis of Zr from aqueous and non-aqueous solutions at room temperature, experimental equipment, use of a vitrified Zr porcelain crucible, anode graphite rods and Mo, Ni, nichrome, and Cu cathodes, production of amorphous Zr powder, and thermochemical data on cell reaction. A literature survey containing 62 references are included. (W.L.H.)

2513 NYOO-1026
Horizons, Inc., Cleveland.
THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS. Progress Report No. II. M. A. Steinberg. Nov. 10, 1949. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 17p. Contract AT(30-1)-696. $3.30(ph OTS); $2.40(mf OTS).

A method for the electrodeposition of Zr from a fused salt bath is disclosed. Continuous, adherent, bright metallic deposits of Zr on a copper cathode were produced and duplicated by electrolyzing a salt bath mixture containing 35% K_2ZrF_6 and 65% NaCl above 1580°F, the transition temperature of Zr from the HCP to the BCC crystal structure. This structure with its attendant lattice dimensions fulfills the conditions of epitaxy when a copper cathode is used, a requirement for the production of an adherent, continuous deposit. Current densities from 13 to 100 amp/dm^2 were investigated and deposits were obtained in all cases, the only variation being in the thickness and crystal size of the deposit. In addition, the production of Zr by fused salt electrolysis can be made semicontinuous by utilizing $(NH_4)_2ZrF_6$ as a feed material to the electrolyte. Zirconium is thus made available for deposition and no dilution of the electrolyte occurs. (auth)

2514 NYO-1027
Horizons, Inc., Cleveland.
THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS. Merle Sibert and M. A. Steinberg. Feb. 15, 1950. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 36p. Contract [AT(30-1)-696]. $6.30 (ph OTS); $3.00(mf OTS).

2515 NYO-1028
Horizons, Inc., Cleveland.
THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS. Merle E. Sibert, Alfred A. Topinka, and Morris A. Steinberg. Apr. 31, 1950. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 30p. Contract AT(30-1)-696. $6.30(ph OTS); $3.00(mf OTS).

2516 NYO-1029
Horizons, Inc., Cleveland.
THE PRODUCTION OF ZIRCONIUM BY FUSED SALT ELECTROLYSIS. Merle E. Sibert, Morris A. Steinberg, and Eugene Wainer. Aug. 4, 1950. Changed from OFFICIAL USE ONLY Aug. 16, 1956. 22p. Contract AT(30-1)-696). $3.30(ph OTS); $2.40(mf OTS).

2517 P-804
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 5 FOR THE PERIOD NOVEMBER 1–NOVEMBER 30, 1946. C. B. Sawyer. Jan. 7, 1947. Decl. Feb. 7, 1956. 26p. Contract W-22-075-Eng-11. $4.80(ph OTS); $2.70(mf OTS).

Progress is reported in development of a process for production of Be metal. Developments in vacuum sublimation and reduction of BeF_2 are outlined. (T.R.H.)

2518 P-810
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 11 FOR MAY 1–MAY 31, 1947. P. R. Kalischer. July 30, 1947. Decl. Feb. 7, 1956. 34p. Contract W-22-075-Eng-11. $6.30(ph OTS); $3.00(mf OTS).

Pilot plant work on the vacuum decomposition of NH_4BeF_3 is completed. Progress is reported in separation of Be from reaction mixture and reduction of $BeCl_2$ with Mg. (T.R.H.)

2519 P-811
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 12 FOR JUNE 1–JUNE 30, 1947. SECTION A. FLUORIDES. P. R. Kalischer. 35p. SECTION B. CHLORIDE REDUCTION. S. J. Morana. 10p. 1947. Decl. Feb. 7, 1956. Contract W-22-075-Eng-11. $7.80(ph OTS); $3.30(mf OTS).

Developments in the production of pure Be metal by reduction of BeF_2 and $BeCl_2$ by Na and Mg respectively, and vacuum decomposition of NH_4BeF_3, are reported. (T.R.H.)

2520 P-812
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 13 FOR JULY 1–JULY 31, 1947. SECTION A. FLUORIDES. P. R. Kalischer. 24p. SECTION B. CHLORIDES. S. J. Morana. 10p. 1947. Decl. Feb. 7, 1956. Contract W-22-075-Eng-11. $6.30(ph OTS); $3.00(mf OTS).

Progress is reported in separation of Be metal from the reaction mixture, and also in development of associated analytical procedures. (T.R.H.)

2521 P-813
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 14 FOR AUGUST 1–AUGUST 31, 1947. SECTION A. FLUORIDES. P. R. Kalischer. 28p. SECTION B. CHLORIDES. S. J. Morana. 10p. 1947. Decl. Feb. 7, 1956. Contract W-22-075-Eng-11. $6.30 (ph OTS); $3.00(mf OTS).

2522 P-816
Brush Beryllium Co., Cleveland.
PROGRESS REPORT NO. 17 FOR NOVEMBER 1–NOVEMBER 30, 1947. SECTION A. FLUORIDES. P. R. Kalischer. SECTION B. CHLORIDES. S. J. Morana. 1947. Decl. Feb. 7, 1956. 46p. Contract W-22-075-Eng-11. $7.80(ph OTS); $3.30(mf OTS).

Progress is reported in the vapor phase reduction of BeF_2 by Mg and $BeCl_2$ by Na to produce Be metal. (T.R.H.)

2523 SC-1795(TR)
Sandia Corp., Albuquerque, N. Mex.
THE EFFECT OF LOW TEMPERATURE ON SOFT SOLDER. J. A. Hoffman. Mar. 29, 1951. Changed from OFFICIAL USE ONLY Apr. 12, 1956. 28p. $4.80(ph OTS); $2.70(mf OTS).

No conclusive information is available concerning the effect on soft solder of long-term storage at low temperature. Lead is practically unaffected by low temperature. Pure tin, on which conclusive information is available, is unreliable when exposed to the long-term, low-temperature storage conditions which equipment withstand. Alloying tin with one or more elements inhibits its transformation from white tin, which is relatively strong, to grey tin, which is practically a powder. Alloying tin with aluminum or zinc accelerates the transformation. Adding small amounts of antimony and/or bismuth appears to inhibit the transformation of tin for short periods of exposure. However, the effects of long-term, low-temperature storage on such alloys have not been conclusively established. It is believed that tin plate is sufficiently alloyed, when it is applied either by dipping or by electrolytic deposition, to

inhibit its transformation. Tin may transform at above-zero temperatures; the rate of deterioration has not been established but is known to be very slow. The consensus of most arctic users is that the use of soft solders and tin should be avoided; however, no failure has been observed that is directly attributable to transformation at low temperature. (auth)

2524 SC-3725(M)
Sandia Corp., Albuquerque, N. Mex.
A STUDY OF THE FUNDAMENTALS OF TOLERANCES OF FORM AND POSITION INCLUDING MAXIMUM MATERIAL CONDITION. Oct. 1, 1955. Changed from OFFICIAL USE ONLY Apr. 12, 1956. 69p. $10.80(ph OTS); $3.90(mf OTS).

A study was made to provide a workable means of tolerancing the geometric characteristics of form and position which affect assembly, function and interchangeability. (F.S.)

2525 SEP-57
Sylvania Electric Products Inc., Bayside, N. Y.
THE HOT WIRE PROCESS FOR ZIRCONIUM. II. RESULTS OF SOME PRESSURE MEASUREMENTS IN THE CRACKING BOTTLE. Robert B. Holden. May 24, 1951. Changed from OFFICIAL USE ONLY Aug. 7, 1956. 12p. Contract AT-30-1-Gen-366. (R-5453). $3.30(ph OTS); $2.40(mf OTS).

The results of some pressure measurements made in an operating cracking bottle are described. From this and earlier work it is deduced that the rate-determining step in the cyclic iodide process is the transport of the gaseous reactants. It was further discovered that the initial synthesis of ZrI_4 in the cracking bottle is catalyzed, apparently photochemically, by the light radiated by the filament. It is proposed that the iodide process could be accelerated by forcibly circulating the gases in the cracking bottle. (auth)

2526 SO-3006
Rensselaer Polytechnic Inst., Troy, N. Y. Powder Metallurgy Lab.
POWDER METALLURGY OF BERYLLIUM. Final Report. A. B. Backensto, Jr. and F. V. Lenel. July 31, 1952. Changed from OFFICIAL USE ONLY June 28, 1956. 62p. Contract AT(30-3)-53. $10.80(ph OTS); $3.90(mf OTS).

The aim of this project was to produce bodies consisting of Be particles embedded in a matrix of a ductile metal, with no reaction between the Be and the matrix metal, the bodies having appreciable ductility. Although Cu could be electroplated directly on Be powder in a cyanide plating bath by a modified barrel-plating process, it was found impossible to control the amount of Cu deposited and therefore the ratio of Be and Cu in the plated powder. The amount of Cu deposited in a $CuSO_4$ bath could be closely controlled by the concentration of the bath; the deposits are more spongy than those obtained by electroplating. Be powder plated with Cu by displacement was hot pressed by electrical resistance sintering. The resulting compacts did not show any ductility in a transverse bend test, because in spite of a close control of the sintering process they were either insufficiently sintered or sintered to such a degree that extensive reaction between copper and Be had taken place. When a tumble mixed 50-50 vol. % mixture of −65 + 150-mesh aluminum and −100 + 200-mesh Be powder was hot pressed at 1000°F for 15 min at 50 psi, the resulting ½ in. diameter compact showed appreciable ductility in the transverse-bend test. Mixtures of Be with Cu, brass, Fe and Mo powders hot pressed under the same conditions were not ductile. Compacts 1½ in. in daimeter having a core of a 50-50 vol. % mixture of −325-mesh aluminum powder and −100 + 200 mesh Be powder and a case of pure Al powder were first hot pressed and could then be extruded successfully into 1 in. diameter rods. Transverse-bend test specimens of the core material in these billets were somewhat more ductile than the ½ in. specimens which were merely hot pressed. Preliminary experiments were made on the influence of several variables upon the extrusion of Al sheathed Be−Al compacts. (J.E.D.)

2527 WAPD-88
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
FATIGUE NOTCH SENSITIVITY OF ZIRCONIUM AND ZIRCONIUM ALLOYS. J. J. Kearns and W. L. Mudge, Jr. Oct. 1, 1953. Changed from OFFICIAL USE ONLY July 18, 1956. 46p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30(mf OTS).

S-N fatigue curves for notched and unnotched specimens were determined at room temperature and 399°C for Zr and its alloys with O_2 and Sn. The fatigue limit at 399°C for the unnotched condition increases with increased tensile strength, but the fatigue limit for the notched condition remains essentially unchanged as the tensile strength is increased. A comparison with other engineering materials shows these Zr alloys to possess high ratios of fatigue strength to tensile strength and also high notch sensitivity. (auth)

2528 WAPD-111
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
EFFECT OF COLD WORK ON THE MECHANICAL PROPERTIES OF ZIRCALOY-2. F. Forscher. Dec. 18, 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 45p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30(ph OTS).

The strength and ductility of Zircaloy-2 in the longitudinal and transverse direction as a function of cold work was investigated at 7 selected temperatures between -196 and 500°C. The investigation was initiated in order to evaluate the effect of cold work on the mechanical properties of Zircaloy-2; in particular the effect of cold work upon ductility. The results show that the normal increase of ductility with temperature is halted at about 150°C, and does not continue until above 350°C. This arrest of the normal trend is more pronounced with increasing cold work. In the transverse direction the ductility was found to decrease with increasing temperature between 150 and 350°C when the material was cold worked 25% or more. This behavior is typical of a strain-aging material. (auth)

2529 WAPD-120
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PRODUCTION ANNEALING OF ZIRCALOY-2. J. G. Goodwin and K. M. Goldman. May 25, 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 32p. Contract AT-11-1-GEN-14. $0.75(OTS).

Curves which relate time, temperature, and percent cold reduction with hardness for Zircaloy-2 annealed in air are presented. A discussion of the effect of time and temperature on the O_2 content of Zircaloy-2 is made. Recommendations as to annealing times for various thicknesses are given and corrosion results are reported. (auth)

2530 WAPD-122
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
A MICARTA TUBE VACUUM INDUCTION MELTING FURNACE. E. S. Foster, W. J. Hurford, and R. J. Axton. May 4, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 18p. $3.30(ph OTS); $2.40(mf OTS).

An internally water cooled Micarta tube type, vacuum induction melting furnace is discussed. With minor adaptations the furnace could be used for production melting. The vacuum system, power supply, melting crucibles and molds are also described. Operating pressures of approximately 1 micron are obtained when alloying U-12 wt. % Mo alloy at 1500°C. The general design makes a highly efficient and compact bottom pouring casting furnace. (auth)

2531 WAPD-124

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

ZIRCALOY-2 STRINGER FORMATION AND SHEARABILITY. L. F. Cochrun. June 1, 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 40p. Contract AT-11-1-GEN-14. $6.30(ph OTS); $3.00(mf OTS).

Stringer formation and shearability show no relationship before annealing but do show some relation after annealing. Stringer formation may be satisfactorily analyzed on the bases of, Zircaloy-2 hot shortness above 1700°F and microfissure development and propagation. Stringers can be removed by heat treatment only at temperatures somewhat above 2200°F, but can be prevented from appearing by the use of proper fabrication techniques. (auth)

2532 WAPD-EM-159

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

AN INVESTIGATION OF TYPE 347 STAINLESS STEEL TO WITHSTAND STRESSES CAUSED BY THERMAL CYCLING. D. D. Frederick. Jan. 31, 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 16p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The ability of type 347 stainless steel to withstand thermal-cycling stresses was evaluated. The metal was cycled between 17,280 and 80,000 psi. A system was built to thermal cycle a hollow steel cylinder by heating the outer surface with the induction coil of a 5 kev, 450 kc r-f generator while the inner surface is cooled by circulating H_2O at a constant rate. (F.S.)

2533 WAPD-FE-954

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

ZIRCALOY-2 HOT BEND TESTS PERFORMED BY THE YOUNGSTOWN WELDING AND ENGINEERING CO. W. L. Frankhouser. Aug. 10, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 27p. $4.80(ph OTS); $2.70(mf OTS).

Six-inch long angle shapes were hot formed from Zircaloy-2 strip by the subject company. The work had to be heated between 720 and 865°F to make $\frac{1}{8}$-in. radius bends (~3/4t) in cold dies. This range of temperature included Zircaloy-2 material taken from two ingots and with three variations in metallurgical processing. By preheating the dies to 750°F for one group of samples, it was possible to reduce the furnace preheat 130°F below that required for cold die forming. Heating the work entirely with the dies was proven possible but not advisable. Temperature gradients established through cooling of the samples at their edges necessitated raising the temperatures to a higher level than that needed when the die and work were heated separately. (auth)

2534 WAPD-MDM-5

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

TENSILE PROPERTIES OF HAFNIUM–ZIRCALOY-2 WELDS. H. R. Hoge. Apr. 14, 1954. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 14p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The tensile properties of as-welded specimens of Hf–Zircaloy-2 were obtained. No heat or stress relief treatments were given after welding and prior to testing. Values obtained from welded specimens were compared with those obtained from unwelded specimens. (F.S.)

2535 WAPD-RM-35

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

RECOVERY OF IODINE FROM CRYSTAL BAR UNIT WASH WATER. H. R. Hoge and Z. M. Shapiro. June 20, 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 7p. $1.80(ph OTS); $1.80(mf OTS).

Experiments were conducted to determine which method of I_2 recovery would be the simplest and most economical. The I_2 from Zr crystal bar preparation at WAPD is in a wash solution from the iodide decomposition tank. The recovery process selected involves oxidation of I^- with Cl_2 to I_2 which is sublimed off. (T.R.H.)

2536 WAPD-RM-91

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

THE EFFECT OF TITANIUM CONTENT ON THE AGE HARDENING AND NITRIDING OF TYPE 322 STAINLESS STEEL. M. R. Achter. Sept. 26, 1951. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 10p. $1.80(ph OTS); $1.80(mf OTS).

In a study of the effect of Ti concentration on the age hardening and nitriding of type 322 stainless steel it was found that no more than 70% Ti should be used. (F.S.)

2537 WAPD-RM-152

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

INVESTIGATION OF POSSIBLE METHODS FOR CONSOLIDATING ZIRCONIUM SPONGE FOR USE AS CONSUMABLE ELECTRODES. H. R. Hoge. Nov. 7, 1952. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 9p. $1.80(ph OTS); $1.80(mf OTS).

A review and evaluation of the methods of compacting Zr sponge into a consumable electrode for melting in an arc furnace is given. (T.R.H.)

2538 WAPD-RM-189

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

A COMMERCIAL EXTRUSION OF ZIRCALOY 1. J. Halapatz. June 9, 1953. Changed from OFFICIAL USE ONLY Sept. 12, 1956. 11p. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

Zircaloy tube redraw stock of satisfactory quality was extruded by commercial practice at The Canton Drop Forging and Manufacturing Company. Results of this work seem to indicate that billet heating in molten salt contributes to the successful extrusion of unsheathed sponge zirconium alloys. (auth)

Refer also to abstract 2556.

PHYSICS

2539 AECU-3153

Sandia Corp., Albuquerque, N. Mex.

NUMERICAL CALCULATION OF BLAST WAVES IN A NON-UNIFORM ATMOSPHERE. Paul C. Fife. Nov. 15, 1954. 24p. (TM-253-54-51). $4.80(ph OTS); $2.70(mf OTS).

A machine calculation program is set up which, it is hoped, will yield a description of the propagation of a blast wave through an inhomogeneous atmosphere. The program

allows non-radial flow and is essentially a numerical solution of difference equations used to approximate the differential equations of motion. (auth)

2540 AECU-3224
Sandia Corp., Albuquerque, N. Mex.
THICKNESS VIBRATIONS IN LONG RODS OF BARIUM TITANATE. C. V. Stephenson. July 29, 1955. 11p. (TM-151-55-51). $3.30(ph OTS); $2.40(mf OTS).

A theoretical discussion of thickness vibrations is presented, and the relevance of resonant and anti-resonant frequencies in the calculation of d_{33} is shown. (T.R.H.)

2541 BW-5402
Babcock and Wilcox Co. Research and Development Dept., Alliance, Ohio.
LEAKAGE MEASUREMENT TECHNIQUE. W. H. Moyer and E. C. Piotter. Feb. 28, 1952. Changed from OFFICIAL USE ONLY July 2, 1956. 73p. For Westinghouse Electric Corp. [Atomic Power Div.] Subcontract 14-302. $12.30(ph OTS); $4.50(mf OTS).

The leakage measurement techniques which are used by The Babcock & Wilcox Company in testing pressure vessels, gaskets and other equipment are described. The use of the mass-spectrometer type He leak detector is preferred where high sensitivity is desired. An appendix shows calculations comparing relative amounts of water and helium leakage to be expected. Results of leak tests of vessels in production are included. (auth)

2542 BW-5409
Babcock and Wilcox Co. Research and Development Dept., Alliance, Ohio.
FLEXITALLIC GASKETS FOR MECHANICAL CLOSURES. W. H. Moyer and E. C. Piotter. Jan. 21, 1952. Changed from OFFICIAL USE ONLY July 2. 1956. 39p. For Westinghouse Electric Corp. [Atomic Power Div.] Subcontract 14-302. $6.30(ph OTS); $3.00(mf OTS).

Leakage rates have been determined for two types of flexitallic gaskets. The first type was an AISI 347 gasket with asbestos filler. The second type was an AISI 347 gasket with nickel filler. A single gasket such as would be used in ordinary practice, and two concentric gaskets were tested. Test fluids were water and helium. Test conditions included temperatures up to 500°F, and pressures up to 2500 psi. Single gaskets or double nickel-filled gasket arrangements are not satisfactory. The two concentric asbestos-filled Flexitallic gaskets with a vent between should be satisfactory for full size vessel tests, and the leakage, though appreciable, can be handled by various means. (auth)

2543 CF-55-9-37
Oak Ridge National Lab., Tenn.
SYMMETRICALLY LOADED CYLINDRICAL SHELL WITH FIXED ENDS. L. E. Anderson. Sept. 7, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Formulas are developed for the stresses and deflections in a circular cylindrical shell which is submitted to a uniform internal or external pressure. No axial forces are considered to be acting on the shell. The wall thickness of the shell is taken as constant and the ends of the shell are considered to be rigidly held. (auth)

2544 KAPL-M-GH-6
Knolls Atomic Power Lab., Schenectady, N. Y.
STRESSES IN A DISK DUE TO NON UNIFORM HEATING OF ITS PERIPHERY. G. Horvay. May 21, 1951. 61p. Contract W-31-109-eng-52. $10.80(ph OTS); $3.90(mf OTS).

An appraisal is made of the temperature and stress transients in disks subjected to edge heating. Treatment is given first to stresses and distortion in a solid disk when steady temperature distribution is maintained. Secondly, the transient in a solid disk due to applied edge temperature is treated. The results are extended to perforated disks of triangular layout. (T.R.H.)

2545 KAPL-M-GH-15
Knolls Atomic Power Lab., Schenectady, N. Y.
ANALYSIS OF FLANGED SHELL JOINTS AND THE MECHANISM OF BOLT FAILURE. G. Horvay. Nov. 8, 1954. 155p. Contract W-31-109-eng-52. $0.75(OTS).

Formulas are given for the stresses and deformations of a composite plate due to distributed weight loads, edge moments, and edge shear loads; for the stresses and deformations of a flanged shell due to membrane loads, edge moments, and edge shear loads; and for stresses and deformations of a bolt under combined tension, bending, and shear. The results are then combined to analyze the joint formed by a flanged shell-plate-bolt combination. (auth)

2546 KAPL-M-JWM-1
Knolls Atomic Power Lab., Schenectady, N. Y.
DIRECT CONVERSION OF FISSION ENERGY BY THE THERMOELECTRIC POWER OF SEMICONDUCTORS. James W. Moyer. Oct. 26, 1954. 5p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The direct conversion of fission energy to electricity using the enhanced thermoelectric properties of Ge is shown to be potentially the most efficient process considered to date. A sample calculation shows that efficiencies in excess of 15% may be obtained. (auth)

2547 WAPD-115
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
SHOCK CALCULATIONS FOR AN ELASTIC SYSTEM WITH DISTRIBUTED MASS, USING THE STARTING VELOCITY CONCEPT. Carl M. Friedrich. Dec. 15, 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 51p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30 (mf OTS).

A method is presented for applying to the shock study of any elastic structure on a rigid foundation the classic theory of response of an elastic structure to any known motion of its foundation. The procedure includes setting up equations of motion, calculating the low-frequency modes of vibration, determining the response of each mode to the shock intensity, and calculating forces deflections for this response. The method is good for obtaining accurate mode responses by distributing the mass of the structure into as many points as desired and setting up the basic mode equations for computer operation. Detailed numerical calculations are given for determining the effects of shock on a particular structure composed of steel cylinders and tubes. (J.E.D.)

2548 WAPD-RM-133
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
IN-PILE TESTS OF STR COMPENSATED ION CHAMBERS. H. S. McCreary, Jr. and Robert T. Bayard. July 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 9p. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

Experiments conducted with the STR compensated ionization chambers indicate that the range of neutron detection will be in the order of six and one-half decades. The electrically adjusted compensation has been found to be very stable over an extended period of operation. (auth)

2549 WAPD-TN-511
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
ENERGY CAPACITY OF ELASTIC-PLASTIC BEAMS. C. M. Friedrich. June 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 34p. Contract AT-11-1-GEN-14. $6.30(ph OTS); $3.00(mf OTS).

A procedure is presented for calculating strains and deflections in elastic-plastic steel beams in terms of energy capacity or starting velocity. Graphs based on the calculations for quick determination of peak strain, maximum permanent strain, peak deflection, maximum permanent deflection in steel beams of various cross sections, and loading conditions are given. (J.E.D.)

2550 WAPD-TN-516
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
BOUNDARY CONDITIONS IN MULTI-REGION REACTOR THEORY. H. L. Garabedian, D. Mumford, and R. R. Schiff. June 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 43p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30(mf OTS).

It has previously been established that the core-reflector interface boundary conditions associated with two group diffusion theory and a one-dimensional geometry can be expressed in the form $D_s \phi_s' = a_1\phi_s + a_2\phi_f$, $D_f\phi_f' = b_1\phi_s + b_2\phi_f$, where the diffusion constants, D_s and D_f, and the fluxes and their derivatives are associated with the core region and where the coefficients a_1, a_2, b_1, b_2 are functions of the reflector parameters and the special mathematical functions peculiar to the reflector region. The use of such boundary conditions simplifies most criticality and flux determination problems in that the reflector region can, if desired, be virtually eliminated from consideration. The procedure is extended to a multi-region problem in which attention is focused on a single interior region and where boundary conditions of the stated form are obtained at the interfaces between the single isolated region and adjacent regions. The single interior region is one which has either inhomogeneous or homogeneous characteristics and in which the eigenvalues associated with a criticality problem remain to be determined. The surrounding regions may be either multiplying or non-multiplying, but are assumed to have homogeneous characteristics. If the isolated region has inhomogeneous characteristics the criticality problem can be solved with the aid of large scale computing equipment. (auth)

2551 Y-B20-67
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROCESS DEVELOPMENT SEMINARS. NOTES PREPARED FOR A SERIES OF SEMINARS HELD DURING THE PERIOD, SEPTEMBER 1947 TO JULY 1948. June 1950. Changed from OFFICIAL USE ONLY Oct. 29, 1956. 202p. Contract W-7405-eng-26. $31.80(ph OTS); $9.30 (mf OTS).

The subjects discussed are: arcs in magnetic fields, electron emission from filaments, arc ionization, magnetic theory, ion motion in electric and magnetic fields, uranium chemistry, isotope applications, plasma oscillations, radar, nuclear reactions, transmutation, ion motion in arcs, beam size and process efficiency, probe measurements in a plasma, and applications of differential equations. (T.R.H.)

2552 Y-F8-6
[Oak Ridge National Lab., Y-12 Area, Tenn.]
THEORETICAL EQUATIONS FOR ESTIMATING THERMAL CONDUCTIVITY OF LIQUIDS. S. V. Manson. Nov. 13, 1950. Changed from OFFICIAL USE ONLY Aug. 15, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Theoretical relations useful in roughly estimating the thermal conductivities of non-metallic liquids and of pure liquid metals are discussed. The relation for non-metallic liquids is used to estimate the thermal conductivity of fused fluorides. Conductivities of roughly 1.5 and 0.7 BTU/hr-ft-°F are calculated for LiF and KF, respectively. It is shown that the use of the Wiedemann-Franz-Lorenz relation between thermal and electric conductivities does not give an estimate of the total thermal conductivity of non-metallic compounds ionized in the fused state. (auth)

AEROSOLS

2553 KAPL-575
Knolls Atomic Power Lab., Schenectady, N. Y.
HEALTH PHYSICS DIVISION DEVELOPMENT AND RESEARCH ACTIVITIES. Semiannual Progress Report. R. W. Houston. July 1, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 35p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The penetration characteristics of Whatman No. 40 and Hellingsworth and Vose H-70 filter papers have been determined as functions of particle size in the range 0.2 to 1.5 μ and face velocity in the range 5 to 50 cm/sec. The results indicate that both types are adequate for routine determination of aerosol concentrations. An attempt is made to explain the data on the basis of various conceivable filtration mechanisms. Flow resistance data on the two papers have also been measured and correlated with the fiber size, filter thickness, and porosity of each paper. A brief report on the final status of work on the electrostatic precipitator is included. An equation has been derived by which the true geometry factor of any installation utilizing cylindrical thin-walled G-M tubes may be readily calculated. Effects of asymmetry in mounting in any direction may also be readily calculated. (B.J.H.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2554 AECU-3236
[Sandia Corp., Albuquerque, N. Mex.]
SOME BASIC PROPERTIES OF BARIUM TITANATE. Travis P. Stuart. Feb. 18, 1953. 14p. (TM-10-53-53). $3.30(ph OTS); $2.40(mf OTS).

This memo summarizes some experiments concerning basic properties of barium titanate. All specimens contained 4 per cent lead titanate. Studies have been made of properties versus the variables of pressure, temperature, and applied potential field. Properties included in this preliminary investigation are charge developed, dielectric constant, resistance, and dielectric strength. (auth)

2555 AECU-3313
[Sandia Corp., Albuquerque, N. Mex.]
A STUDY OF THE EFFECT OF TEMPERATURE ON THE RATIO D33/D31 IN POLYCRYSTALLINE BARIUM TITANATE. E. G. Franzak. June 21, 1955. 9p. (TM-128-55-51). $1.80(ph OTS); $1.80(mf OTS).

The experimental methods involved in measuring the radial and thickness coupling coefficients are presented. These methods are used in a study of the ratio of the two piezoelectric constants d_{33} and d_{31}. (auth)

2556 CF-53-2-249
Oak Ridge National Lab., Tenn.
DEFORMATION OF COPPER SINGLE CRYSTALS AT 300°K AND 78°K. T. H. Blewitt. [Feb. 1953]. 26p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Single crystals of Cu were deformed at 78 and 300°K. There was no temperature dependence in the critical shear stress in this range of temperature and for shear strains less than about 0.25 the stress-strain relationship was linear and independent of temperature. The linear relationship of the stress-strain curve persisted for higher strains at 78°K. The annealing at 300°K of crystals deformed at 78°K showed a decrease in electrical resistance accompanied by a phenomena suggestive of strain aging. The magnitude of the recoverable resistance was dependent on the strain having a relationship which was faster than a linear one. A measurable decrease in electrical resistance was not observed for strains less than about 0.30. These results are interpreted according to the theory of dislocations with particular emphasis to the theory of work hardening. (auth)

2557 HW-34083
Hanford Atomic Products Operation, Richland, Wash.
THE AEOLOTROPIC ELASTIC RELATIONS FOR URANIUM CRYSTALS. Kenneth R. Merckx. Dec. 17, 1954. 8p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80 (mf OTS).

Some of the relationships used in anisotropic crystal analysis were presented to show some of the complications which may be expected in theoretical analyses. (J.E.D.)

ELECTRICAL DISCHARGE

2558 LA-1432
Los Alamos Scientific Lab., N. Mex.
GAS DISCHARGES. Lecture Series by W. P. Allis. Notes by Wayne Arnold. Aug. 1951. Changed from OFFICIAL USE ONLY July 18, 1956. 32p. Contract W-7405-eng-36. $6.30(ph OTS); $3.00(mf OTS).

Extensive mathematical analyses are given of two types of "electrodeless" gas discharges, namely discharges in a torus produced by a dB/dt through the center, and discharges produced in hydrogen gas. (L.M.T.)

GASES

2559 CF-54-1-46
Oak Ridge National Lab., Tenn.
THE MEASUREMENT AND THE CALCULATION OF THE LIQUID HELIUM VAPOR PRESSURE-TEMPERATURE SCALE FROM 1° TO 4.2°K[+]. R. A. Erickson and L. D. Roberts. Jan. 13, 1954. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Measurements between 1.2 and 4.2°K on a paramagnetic salt using a mutual inductance bridge apparatus indicate errors in the presently accepted liquid He temperature scale amounting to 12 millidegrees at the λ point. These data, together with those of Kistemaker, are found to be in good agreement with a temperature scale calculated from the other thermodynamic properties of He. The calculated scale is further confirmed by a comparison between the calculated and observed latent heat of vaporization. Accepting as correct the boiling point determination of Keesom and Clusius, the estimated accuracy of the proposed temperature scale is 1.5 millidegrees below λ point and 3 millidegrees above the λ point. (auth)

2560 KAPL-M-LFE-13
Knolls Atomic Power Lab., Schenectady, N. Y.
APPROXIMATION FORMULA FOR THE SECOND VIRIAL COEFFICIENT OF A LENNARD-JONES 6-9 GAS. Leo F. Epstein. Nov. 15, 1952. 5p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

INSTRUMENTS

2561 AECD-4088
Hanford Works, Richland, Wash.
EFFECT OF RADIATION ON TELEVISION EQUIPMENT. Final Report. H. J. White. Feb. 7, 1950. Decl. Dec. 3, 1955. 9p. Test Project No. 15. Contract [W-31-109-Eng-52]. (HDC-1630). $3.30(ph OTS); $2.40(mf OTS).

The effect of exposure to high-intensity radiation over an extended period on the performance of a "Utiliscope" wired image-dissector television system, manufactured by the Diamond Power Specialties Corp., was investigated. The television assembly consisted of a camera unit, an amplifier, and a cathode-ray monitor. (J.E.D.)

2562 AECU-3222
[Sandia Corp., Albuquerque, N. Mex.]
A TRANSISTORIZED BINARY COUNTER FOR EXTREME ENVIRONMENTS. J. E. Marceau. May 27, 1955. 15p. (TM-113-55-54). $3.30(ph OTS); $2.40(mf OTS).

A transistorized binary counter circuit is described that operates over a temperature range of −65 to +165°F. The supply voltage is 28 ± 4 volts and the maximum trigger repetition rate is 5 kc. The binary circuit is presettable and resettable by means of a switching arrangement that can be mechanized. Texas Instrument type 904 silicon transistors whose large signal current gain is 2.8 or greater at a −65°F can be used in this circuit. (auth)

2563 AECU-3223
[Sandia Corp., Albuquerque, N. Mex.]
BEHAVIOR OF TRANSISTORS IN A MAGNETIC FIELD. Howard H. Sander. Aug. 11, 1954. 7p. (TM-151-54-51). $1.80(ph OTS); $1.80(mf OTS).

Experiments are described which show that magnetic fields can exert a controlling influence on the operating characteristics of point contact transistors. The effect is especially evident when the transistor is operated in its negative resistance region. The frequency of an oscillator can be varied, or a switch made to trigger by applying a magnetic field to the transistor. Some applications of the principle are suggested. (auth)

2564 AECU-3237
[Sandia Corp., Albuquerque, N. Mex.]
TIME INTERVAL MEASURING DEVICE FOR VERY HIGH PRECISIONS. J. E. Gross. Jan. 18, 1954. 14p. (TM-3-54-54). $3.30(ph OTS); $2.40(mf OTS).

A system of time interval measurement capable of very high accuracy in the range of one microsecond to several seconds and even minutes is described. A laboratory model with an accuracy of ±0.025 μseconds has been successfully operated. The technique used is inherently reliable and is capable of being extended to an accuracy of ±0.01 μsecond. (auth)

2565 AECU-3245
Carbide and Carbon Chemicals Co. [K-25 Plant], Oak Ridge, Tenn.
A McLEOD PRIMARY PRESSURE STANDARD. L. M. Lund. Dec. 16, 1953. 9p. Contract [W-7405-eng-26]. (KLI-2749). $1.80(ph OTS); $1.80(mf OTS).

In studying flow through porous media at low pressures, pressure measuring devices must be calibrated against a direct standard. The design of such a standard is described. Accuracies better than 1% were obtained in the range 5 to 300×10^{-4} cm Hg. (D.E.B.)

2566 AECU-3248
[Sandia Corp., Albuquerque, N. Mex.]
SERVO-STABILIZATION OF DRIFT IN WIDE-BAND D-C AMPLIFIERS. J. M. Simmons, Jr. Apr. 13, 1954. 22p.

(TM-10-54-54). $4.80(ph OTS); $2.70(mf OTS).

This report describes a method of diminishing the zero-drift characteristics of wide-band d-c amplifiers. The method is effective whether the amplifier is used with full open-loop gain or as a closed-loop computing element. (auth)

2567 AECU-3309

[Sandia Corp., Albuquerque, N. Mex.]

A CENTRIFUGAL GOVERNOR. R. P. Stromberg. Feb. 4, 1955. 8p. (TM-12-55-53). $1.80(ph OTS); $1.80(mf OTS).

A preliminary mathematical analysis is made of the equations of motion of a centrifugal governor of a unique design. (auth)

2568 AECU-3310

[Sandia Corp., Albuquerque, N. Mex.]

THE SA-299 MULTITURN DIRECT DIGITAL INDICATING DIAL. John L. Hilton. Apr. 25, 1955. 10p. (TM-31-55-13). $1.80(ph OTS); $1.80(mf OTS).

The development of a direct reading dial using counter wheels for digital presentation is described. Development is traced from the initial requirements to the finished engineering prototype. The human engineering analysis is fully described. (auth)

2569 AECU-3311

[Sandia Corp., Albuquerque, N. Mex.]

THE SA-242 MULTITURN LINEAR POTENTIOMETER. John L. Hilton. Apr. 20, 1955. 8p. (TM-75-55-13). $1.80(ph OTS); $1.80(mf OTS).

The development of a 9.6-turn (3456°), 1000-ohm, helical potentiometer, with limiting mechanical stops, requiring no special external trim resistor, is described. Development is traced from the initial requirements to the finished engineering prototype. The theory of operation is fully described. (auth)

2570 AECU-3316

[Sandia Corp., Albuquerque, N. Mex.]

A TIME-MARKER GENERATOR AND A 12- TO 18-KILOCYCLE RECEIVER. Jack E. Marceau. Oct. 3, 1955. 8p. (TM-217-55-54). $1.80(ph OTS); $1.80(mf OTS).

A time-marker generator and a 12- to 18- kilocycle receiver for use with Division 5226's microbarograph installations are described. (auth)

2571 AECU-3317

[Sandia Corp., Albuquerque, N. Mex.]

A TIME INTERVAL GENERATOR OF MILLIMICROSECOND PRECISION. J. E. Gross. Oct. 12, 1955. 30p. (TM-218-55-54). $6.30(ph OTS); $3.00(mf OTS).

A device has been developed for the generation of precise time intervals in the 25 to 140 μsec range. Accuracy is ± 5 millimicroseconds and stability is 10 parts per million. The time interval is defined by two pulses which appear on separate terminals. The pulses are capable of driving a variety of electronic circuitry so that the instrument may be used as a test instrument as well as a laboratory standard. (auth)

2572 HW-27784

[Hanford Atomic Products Operation, Richland, Wash.]

SLUG MANIPULATOR. M. T. Slind. Apr. 30, 1953. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

A manipulator designed to support a slug at the bottom of the viewing basin, so that an operator could view it through a binocular telescope and be able to see all surfaces, was designed. Hydraulic power, using water, operates the manipulator and gears. Flexible shafts, and mechanical linkages were avoided when possible. (F.S.)

2573 K-749

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

AN INSTRUMENT FOR RECORDING SMALL LINEAR DISPLACEMENTS. G. M. Lindner. Apr. 4, 1951. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

An electronic instrument has been developed and sucessfully used to measure and record the expansion of compressor shafts for K-29 and K-31. The developed unit has a linear output over a range of 100 mils expansion with an accuracy of ± 2% of full scale. Investigation showed that movements up to 200 mils can be measured with a linear transformer output. The maximum range of linearity was not determined as expansion over 100 mils was not anticipated. (auth)

2574 KAPL-1247

Knolls Atomic Power Lab., Schenectady, N. Y.

A REVERSIBLE DIGITAL TRANSDUCER AND COUNTER. R. S. Stone and E. J. Wade. Dec. 15, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 21p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A detailed description of an electromechanical transducer and an electronic counter is given. The unique feature of this counting system is that the counter is reversible; that is, the system automatically adds or subtracts counts from the accumulated total. The logical function of addition or subtraction is determined by the direction of rotation of the transducer. (auth)

2575 KAPL-M-MBR-2

Knolls Atomic Power Lab., Schenectady, N. Y.

AN EXTENSOMETER SYSTEM FOR THE DIRECT MEASUREMENT OF NATURAL STRAIN. Myron B. Reynolds. July 10, 1951. 22p. Contract W-31-109-eng-52. $4.80 (ph OTS); $2.70(mf OTS).

An extensometer and indicator for direct measurement of natural strain have been constructed. The extensometer covers the ranges 0 to 10% and 0 to 50% natural strain. The accuracy of the strain measurement is largely limited by the uniformity of extension of the specimen being measured, the limiting accuracy of the instrument proper being of the order of ±0.5% of full scale. Data illustrative of the performance of the instrument are presented. (auth)

2576 LAMS-618

[Los Alamos Scientific Lab., N. Mex.]

FRAUNHOFER DIFFRACTION PATTERN PRODUCED BY A SLIT OF VARYING WIDTH AND ITS APPLICATION TO HIGH SPEED CAMERAS. F. E. Geiger. Nov. 11, 1947. Changed from OFFICIAL USE ONLY July 18, 1956. 15p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

A theoretical and experimental investigation is made of the diffraction pattern produced by a slit, whose aperture varies uniformly from a constant value A to zero. The results of this investigation are applied to a proposed high speed camera. It is shown that diffraction effects are very serious and cannot be neglected. It seems, unless the suggested design of this high speed camera is changed, the camera will be of little use for accurate measurements, and photographs will show too much blur to give details. (auth)

2577 SC-2076(TR)

Sandia Corp., Albuquerque, N. Mex.

THE RAWIDAR SYSTEM. K. R. Fortman, A. R. Kilbey, R. E. Reed, and G. W. Rodgers. Jan. 22, 1952. Changed from OFFICIAL USE ONLY April 12, 1956. 43p. $6.30 (ph OTS); $3.00(mf OTS).

The Rawidar (radar wind data recorder) system was designed to obtain winds-aloft data (Rawin data) and to record

this data automatically in a form that can be reduced by machine or electronic calculators. A block diagram of the Rawidar system and a photograph of the IBM and Telecorder installation are presented. The system records on IBM cards samples of radar azimuth, elevation, and slant range. Sampling time is a few microseconds, and the sampling intervals (normally 10 seconds) are controlled by a standard clock. An auxiliary recorder is included in the system for increased reliability. A special remote control panel is also included for controlling the operation of the system. (auth)

2578 SC-3305(TR)
Sandia Corp., Albuquerque, N. Mex.
SANDIA DIAPHRAGM-TYPE PRESSURE TRANSDUCER FOR SHOCK WAVE MEASUREMENTS. Peter K. Church. Jan. 6, 1954. 50p. $0.35(OTS).

A diaphragm-type, variable reluctance, pressure transducer is described that was developed especially for transient pressure measurements. The gage was built in several pressure ranges from $\pm\frac{1}{2}$ to ±50 psi. The excellent operation in low pressure applications is of particular interest as well as the fact that the gages can be greatly overloaded without damage. The transducer is very linear, has small amounts of hysteresis, small temperature effects, and negligible acceleration response. Even of the low pressure range units, the resonant frequencies are very high, and fill times are rapid enough to allow a gage rise time as fast as 50 μsec. A brief description of the electrical bridge circuits, fabrication and assembly techniques, and the method of pre-stressing diaphragms is also included along with a few typical applications. (auth)

2579 UCRL-1130
California. Univ., Berkeley. Radiation Lab.
SQUARE WAVE TESTING OF AIR DIELECTRIC COAXIAL TRANSMISSION LINE COMPONENTS. Robert E. Heller. June 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 33p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

An outline is given for mismatch and delay measurement methods on air dielectric transmission line components, and techniques for square wave testing are outlined. Equipment design of the needed pulsers, attenuation and delay sections, and high speed oscilloscopes is disclosed. (auth)

ISOTOPES

2580 HW-33480
[Hanford Atomic Products Operation], Richland, Wash.
Ru^{103}: Ru^{106} RATIO DETERMINATIONS. R. W. Perkins. Oct. 20, 1954. 26p. Contract [W-31-109-Eng-52]. $4.80 (ph OTS); $2.70(mf OTS).

Self-absorption curves were prepared for Ru^{103} and Ru^{106}. The percentages of the two β energy components of the Ru^{103} isotope were determined by absorption studies. The data, together with counting ratios of known $Ru^{103-106}$ mixtures made with and without an 83.5 mg/cm^2 aluminum absorber, were used to prepare a group of graphs from which it is possible to determine readily both isotope ratio and disintegration rate of a given sample. The only measurements necessary for the determinations of the isotope ratio and the disintegration rate are counting rates with and without an 83.5 mg/cm^2 aluminum absorber and the weight of the residue on the plate being counted. The age of fission product samples up to one year after irradiation may be determined by use of the charts prepared. Samples older than one year contain such a small percentage of Ru^{103} that accurate determinations of their ages by this method are not feasible. (auth)

ISOTOPE SEPARATION

2581 CF-52-2-124
Ionics, Inc., Cambridge, Mass.
THE IONIC FRACTIONATION STILL. Final Report [for] February 1, 1951–January 31, 1952. J. A. Marinsky, E. Parsi, and S. Alexander. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 72p. [For Oak Ridge National Lab.] Contract W-7405-eng-26, Subcontract 363. $12.30(ph OTS); $4.50(mf OTS).

The nature of α, the separation factor for a single membrane plate, has been studied in its relation to mobilities, diffusivities, ion-exchange rates, concentration, ion species and linear velocity of solutions. On the basis of this study, it has been postulated that the kinetics involved in a single plate separation, where solution on both sides of the membrane is of the same composition at the start, is as follows: At very low current density values, ion exchange processes presumably dominate and no separation occurs since both faces of the membrane are essentially in equilibrium with the bulk electrolyte. If the current density is increased, chemical potential effects remain important at the anode face, whereas this effect has little influence on the cathode face behavior, and diffusion at the anode face becomes controlling. At high current density values, the ion exchange effects become negligible and the separation is dominated by diffusion of ions across a polarization-induced diluted film region. It appears that the rate of mass transfer is controlled by diffusion across solution rather than across the resin, even at high solution concentrations. It has been found that optimum I-Still operation is obtained when concentrated solutions, high linear flow rates, and current density to normality ratios of no greater than 200 are employed. If diffusivities of ions are sufficiently different across a polarization-induced diluted film region, the I-Still can be operated at higher current densities to achieve production at the expense of increased operating costs. It appears that only the separation of ions of the same valence under these operating conditions can be estimated from simple diffusion measurements. Selective complexing of the ions to be separated can be employed wherever possible to improve a given separation, thereby permitting smaller equipment. A decrease in the cost of operation in a given separation process can thus be effected if increased resistance of each membrane plate-solution component is not too greatly increased by the removal of ions due to the complexing action. (auth)

2582 K-324
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
BAFFLE COOLING IN ELECTROMAGNETIC SEPARATION OF MERCURY ISOTOPES. J. F. Sheehan, I. Spiewak, and J. Sandock. Sept. 25, 1948. Decl. Feb. 8, 1956. 29p. For Carbide and Carbon Chemicals Corp. Y-12 Plant. Contract [W-7405-eng-26], Subcontract 70. $4.80(ph OTS); $2.70(mf OTS).

Several baffle cooling systems, based on liquid N, dry ice, and mechanical refrigeration were designed, and cost and performance characteristics estimated. Experimental calutron runs were outlined as a basis for final design of the required cooling system. (auth)

2583 Y-537
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
URANIUM RECOVERY BY SPRAY CLEANING. R. F.

McKee, Don Phillips, and John S. Reece. Dec. 7, 1949. Decl. Feb. 17, 1956. 30p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

The M and L units of a calutron D-set can be effectively cleaned, for production recovery of U and for reuse, by spray washing with aluminum nitrate raffinate or with dilute nitric acid. A rotating spray washer for the M-unit has been developed and proved satisfactory for production operation. Most effective cleaning was obtained with the wash solution at a temperature of 70°C, recirculating approximately 25 gallons shorter time. Spray cleaning methods were developed and equipment designed for effective cleaning of the diffusion pumps and manifolds, decreasing the time and labor cost involved in this periodic operation. (auth)

MASS SPECTROGRAPHY

2584 AECD-4211
Tennessee Eastman Corp., Oak Ridge, Tenn.
MASS SPECTROMETRIC DETERMINATION OF ISOTOPIC RATIO WITH VARYING ION BEAM INTENSITY. A. E. Cameron and J. R. White. Mar. 6, 1946. Decl. Nov. 28, 1955. 6p. Contract [W-7401-eng-23]. (B-6.460.12). $1.80(ph OTS); $1.80(mf OTS).

An apparatus is described which applies alternate pulses from two ion beams to a galvanometer network. The isotopic ratio is read directly from a potentiometer. The comparison is independent of ion beam intensity. This method is not practical for application to the standard Nier assay instrument because of the low ion currents normally used. It is suggested that this comparison method may have utility in a spectrometer utilizing a high intensity ion source such as capillary arc or condensed spark. (auth)

MATHEMATICS

2585 AECU-3203
Sandia Corp., Albuquerque, N. Mex.
NOTE ON THE NUMERICAL EVALUATION OF INTEGRALS OF THE FORM $\int_{-\infty}^{\infty} f(x)\,\varphi(x)\,dx$, WITH PARTICULAR REFERENCE TO THE DETERMINATION OF THE EXPECTATION OF A FUNCTION OF A NORMALLY DISTRIBUTED RANDOM VARIABLE. Sept. 3, 1953. 12p. (TM-145-53-51). $3.30(ph OTS); $2.40(mf OTS).

2586 AECU-3235
[Sandia Corp., Albuquerque, N. Mex.]
A STATISTICAL DATA PLOTTER (NULLI IV). C. E. Maki. Sept. 13, 1954. 12p. (TM-210-54-54). $3.30 (ph OTS); $2.40(mf OTS).

A device is described which enables an operator to feed information in the form of random numbers into the machine and read out the data at any time in graphical form. (auth)

2587 AECU-3303
[Sandia Corp., Albuquerque, N. Mex.]
SPECTRA OF WAVES WITH PERIODIC FREQUENCY MODULATION. L. V. Skinner. Apr. 30, 1953. 22p. (TM-40-53-54). $4.80(ph OTS); $2.70(mf OTS).

A general procedure for the harmonic analysis of a wave with periodically varying frequency is given. Simplifications in the procedure are made for frequency modulating functions having certain properties of symmetry. Expressions for the power in the modulated wave are also derived. Harmonic analyses are made for rectangular and trapezoidal modulating functions. (auth)

2588 AECU-3305
Sandia Corp., Albuquerque, N. Mex.
APPROXIMATIONS TO THE CIRCULAR NORMAL DISTRIBUTION. Nov. 23, 1953. 33p. (TM-168-53-51). $4.80(ph OTS); $2.70(mf OTS).

Discussions are included of approximations to the circular normal distribution and the errors resulting from their use in computing the probability mass in a plane region. (auth)

2589 AECU-3312
[Sandia Corp., Albuquerque, N. Mex.]
RELIABILITY STUDIES OF SYSTEMS IN WHICH COMPONENT RELIABILITIES VARY WITH ENVIRONMENT. C. R. Clark. June 30, 1955. 22p. (TM-127-55-51). $4.80(ph OTS); $2.70(mf OTS).

A method is presented for determining the reliability of a system when the reliabilities of the system components are a function of the environment and the environment can be considered to be a random variable. (auth)

2590 AECU-3314
[Sandia Corp., Albuquerque, N. Mex.]
PSEUDO-RANDOM NUMBERS. G. Y. Pelsor. Aug. 29, 1955. 10p. (TM-186-55-51). $1.80(ph OTS); $1.80(mf OTS).

Statistical tests for randomness have been applied to "random" numbers generated by several methods suitable for use in "Monte Carlo" problems with general purpose digital computers. All the methods tested gave acceptable randomness. (auth)

2591 CF-55-9-41
Oak Ridge National Lab., Tenn.
THE ZEROS OF BESSEL FUNCTIONS AND $x J_{\gamma+1}(x)/J_{\gamma}(x) = \text{CONSTANT}$. Joseph S. Rosen. Sept. 13, 1955. 10p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

2592 KAPL-M-LFE-15
Knolls Atomic Power Lab., Schenectady, N. Y.
CALCULATION OF THE ERROR FUNCTION. Leo F. Epstein. Jan. 15, 1955. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A new method of computing the error function, ϕ which occurs in many problems in heat conduction, diffusion, and reactor neutron physics is demonstrated. (F.S.)

2593 WAPD-105
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE SPACE SIMULATOR METHOD FOR SOLVING THE GROUP DIFFUSION EQUATIONS. R. R. Schiff. Mar. 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 49p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30 (mf OTS).

The space simulator is an electrical analog device for solving the two-group diffusion equations by means of an iterative technique. One of the equations is solved subject to the proper boundary conditions, but with an arbitrary function used as a source term. This solution is then inserted as a source term for the other equation, and the process is continued until further iteration produces no further change in the shape of the solutions. The solutions required for the iteration process are obtained by converting the two differential equations to difference equations and solving each by means of one of two separate electrical resistance networks. A fictitious value of η of U^{235} is found which will make the reactor configuration being examined just critical. Two machines for applying this method are described. The Westinghouse Two-Dimensional Space Simulator is designed to solve the diffusion equa-

tions in the complex geometry of the Submarine Thermal Reactor. The Generalized One-Dimensional Diffusion Equation Space Simulator is a highly flexible device for solving problems in one dimension involving space dependent coefficients in the equations. (auth)

2594 WAPD-PM-3
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
CODING MANUAL FOR THE CIRCLE COMPUTER. R. Goodman. Aug. 1954. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 182p. Contract AT-11-1-GEN-14. $28.80(ph OTS); $8.40(mf OTS).

2595 WAPD-STR-L-583
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].
SIMPLE METHODS OF SETTING UP FIELD PROBLEMS FOR USE ON PASSIVE ANALOG COMPUTERS. William H. Meyer, Jr. June 3, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 10p. $3.30(ph OTS); $2.40(mf OTS).

Procedures are discussed for setting up field problems in terms of an analogous electrical network for use on the passive analog computer. (J.H.M.)

MEASURING INSTRUMENTS AND TECHNIQUES

2596 AECU-3304
[Sandia Corp., Albuquerque, N. Mex.]
THE SQUARE LAW DETECTOR AND NOISE. B. L. Basore. May 22, 1953. 10p. (TM-59-53-54). $1.80 (ph OTS); $1.80(mf OTS).

The problem of the signal-to-noise ratio in the output of a square law device, which has been treated extensively in the literature, is presented in its simplest form to illustrate the loss in signal-to-noise ratio which normally occurs and the advantage of using a large local signal in the detection process. (auth)

2597 CF-51-10-212
Oak Ridge National Lab., Tenn.
APPLICATION OF A SCINTILLATION DETECTOR TO GAMMA-RAY DOSIMETRY. F. K. McGowan and C. E. Clifford. Oct. 16, 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A design is given of a scintillation detector employing an organic phosphor (anthracene $C_{14}H_{10}$) as a sensitive detector which, together with a photomultiplier tube provides a response to γ spectrum radiation proportional to that of body tissues regardless of the energy. Accompanying the description of the instrument are drawings showing the scintillation detection assembly and wiring diagrams. (C.H.)

2598 DP-34
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
A MONITOR FOR SURFACE ADSORBED TRITIUM. D. G. Karraker. Dec. 1953. Changed from OFFICIAL USE ON ONLY June 29, 1956. 15p. Contract AT(07-2)-1. $3.30 (ph OTS); $2.40(mf OTS).

A monitor for detection of surface-adsorbed tritium β particles has been developed. The detecting element is a windowless Geiger tube with the counting gas flowing through it. The normal limit of detection of a single-tube probe is 800 d/m of tritium, while a three-tube probe is probably limited to about 2000 d/m. Both probes have a counting efficiency of about 10% for tritium. (auth)

2599 HW-36478
Hanford Atomic Products Operation, Richland, Wash.
A DOORWAY MONITOR. D. A. Campbell and L. D. Test. Apr. 29, 1955. Changed from OFFICIAL USE ONLY July 6, 1956. 16p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

This report describes a doorway-mounted, hard-β monitor for contamination on the clothing of personnel. A wide-angle, scintillation, β detector having low γ sensitivity is reported. Performance data and circuit descriptions are included. (auth)

2600 HW-38422
Hanford Atomic Products Operation, Richland, Wash.
A SIMULTANEOUS SCALER SYSTEM. R. L. Tomlinson. Aug. 15, 1955. 11p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A simultaneous control unit was designed and built for use with a bank of scalers. The control unit will handle up to eight scalers with about the same effort required by a technician for the previous operation of two assemblies. A description is presented of the electrical and mechanical features of the system. Photographs of the assembly and a wiring diagram are included. (C.H.)

2601 HW-38918
Hanford Atomic Products Operation, Richland, Wash.
IMPROVED CALIBRATION FACILITY. E. E. Donaldson. Aug. 22, 1955. 7p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

A well-type calibration installation is proposed for an improved calibration facility which will reduce the exposure to the personnel and the area, reduce the risk of breaking the radium source, and improve the calibration procedures. (F.S.)

2602 K-48
Carbide and Carbon Chemical Corp. [K-25 Plant], Oak Ridge, Tenn.
HIGH RESOLUTION TUBE RACK. V. H. Kiplinger. Sept. 22, 1947. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 9p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A 616 Hot Trap Line Recorder was converted to a high resolution unit by narrowing the source and collector slits. This instrument could be adapted for portable field use in conjunction with the Automatic Mass Scanner. (auth)

2603 K-190
Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn.
DEVELOPMENT OF THE ARGON GAMMAGRAPH: A WIDE-RANGE CONTINUOUSLY-RECORDING GAMMA MONITOR. G. A. Smith. Mar. 22, 1948. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 19p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

This document covers the development of the Argon Gammagraph, a radiation monitor designed to cover background and emergency radiations and which will not be affected by power line failures. The instrument may be described as a battery operated, high pressure Argon Ionization Chamber and associated amplifier, measuring and continuously recording the intensity of the radiation at the location of the ionization chamber. The range of radiation intensities from 0 to about 1.5 roentgens per 8 hours is covered on four scales which are automatically switched and indexed. The design of the ionization chamber itself was derived from a previous model developed by the University of Chicago. Development was facilitated following initial investigation by authorization to fabricate and install two of these instruments. Design problems, solutions, and data are covered. (auth)

2604 K-785
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
HIGH INTENSITY BETA PROBE FOR USE WITH SAMSON

SURVEY METER. R. W. Schede. June 26, 1951. Changed from OFFICIAL USE ONLY Nov. 28, 1956. 14p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

A high-intensity beta-sensitive probe to be used with the Samson Survey Meter in high level radiation fields was developed to operate in a 200 rep/hr. field. The probe exhibits some ion recombination effects at high levels of radiation intensity but the use of a calibration curve gives sufficiently accurate readings for health physics purposes. Circuit diagrams are included. (F.S.)

2605 K-999
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
CALIBRATION OF INDIUM FOILS FOR PERSONNEL MONITORING. J. C. Bailey, H. F. Henry, and R. C. Rohr. June 1, 1953. Decl. May 25, 1956. 38p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

The relationship between indium foil activity and radiation dosage from a nuclear chain reaction has been determined in order that indium foils may be enclosed in plastic security badges to indicate which persons may have received significant radiation in the event such a reaction should occur accidentally. A reading taken on the badge with a GM-type beta-gamma survey meter shortly after irradiation gives estimates of exposure in the range of 0.2 to 200 rem, whereas if the foil is removed from the plastic, an exposure down to 85 mrem may be detected using a survey meter, or down to 30 mrem with an end-window beta counter inside a lead shield. Curves and a nomograph are given for determining the dosage from a beta-gamma survey meter reading or from the foil counting rate measured with an end-window counter. This determination requires knowledge of the meter reading or counting rate of the foil, the duration of exposure, the decay time from the end of exposure to the start of counting, and the distance from the individual to the reactor. (auth)

2606 KAPL-1117
Knolls Atomic Power Lab., Schenectady, N. Y.
AN AUTOMATIC NEUTRON FLUX SCANNER. R. T. Frost. Mar. 1, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A new technique is described for scanning the short-lived radioactivity induced in strip samples irradiated in a nuclear reactor. An automatic correction is made for the effect of the time decay without recourse to an empirical decay curve. Application of the device to the measurement of reactor power and flux distributions is described, and the results show that reproducibility of the method is one per cent or less. (auth)

2607 KAPL-1283
Knolls Atomic Power Lab., Schenectady, N. Y.
A SUITABLE P-31(n,p)Si-31 THRESHOLD DETECTOR. L. H. Weinberg, R. P. Schuman, and B. A. Gottschalk. Feb. 7, 1955. Changed from OFFICIAL USE ONLY June 26, 1956. 13p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A method for making foils, which are suitable for detecting the $P^{31}(n,p)Si^{31}$ threshold reaction, is described. The foils are made of calcium metaphosphate glass, $Ca(PO_3)_2$, and can be molded or cut into any desired shape or size. These foils have a multiple advantage over most other $P^{31}(n,p)Si^{31}$ detectors of having a fixed geometry, of having a high melting point, and of not having any interfering activity caused by other fast neutron reactions. (auth)

2608 KAPL-M-JRS-6
Knolls Atomic Power Lab., Schenectady, N. Y.
GAMMA RAY MONITORING OF FUEL ELEMENTS. J. R. Stehn. July 2, 1952. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The γ emission rate of fuel material is suggested as a possible nondestructive test of the amount of U^{235} in a fuel element. Basic decay data for U, Th, and Pa isotopes are tabulated. It is thus shown that it is possible to distinguish enriched fuel from diluted with any amount of natural U above 20%. (B.J.H.)

2609 KAPL-M-LHW-4
Knolls Atomic Power Lab., Schenectady, N. Y.
A PROTON-RECOIL SCINTILLATOR FOR FAST NEUTRON DETECTION. L. H. Weinberg. Jan. 26, 1955. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

A relatively easy method of making a fast neutron scintillator with an efficient geometrical arrangement and adaptable to end-window photomultiplier tubes is described. The scintillator consists of a mixture of paraffin and ZnS phosphor pressed into circular grooves cut into a lucite adapter for a photomultiplier tube. Light pulses are produced by recoil protons from the paraffin or lucite causing ionization in the ZnS phosphor. The efficiency is of the order of a few percent for Po-Be neutrons, depending on the amount of discrimination desired against the small γ-ray pulse. (auth)

2610 LA-1683
Los Alamos Scientific Lab., N. Mex.
THE CALIBRATION OF TRITIUM MONITORING DEVICES. M. C. Robbins, B. C. Eutsler, and R. N. Mitchell. June 1954. Changed from OFFICIAL USE ONLY Aug. 8, 1956. 22p. Contract W-7405-eng-36. $4.80(ph); $2.70(mf).

Several methods for setting up known concentrations of T_2 were considered. A dynamic system containing T_2 as HTO vapor or gaseous HT was selected because of the ease of control of variables. The variables that have been considered are: effect of rate of air flow through the instruments; effect of humidity on instrument response; effect of ion collection ahead of the ion chamber; variation of "hold time" from the generation of T_2 to its passage through the ion chamber; and instrument response to several concentrations of T_2 as HTO vapor and gaseous HT. The following types of monitoring devices were calibrated: Model 101 Sniffer of Group P-1; CI-1 Vibrating Reed Electrometer of Group CMR-7; and Modified T1B of Group H-6. (auth)

2611 R-52GL166
General Electric Co. General Engineering Lab., Schenectady, N. Y.
HIGH TEMPERATURE IONIZATION CHAMBER, MARK II FOR S.I.R. E. E. Goodale and D. H. Morley. Aug. 5, 1952. 36p. $6.30(ph OTS); $3.00(mf OTS).

Construction details and performance data are given for a high-temperature, high-shock, neutron-detecting ion chamber. (F.S.)

2612 WAPD-PM-26
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE THERMAL NEUTRON SENSITIVITY OF THE LARGE FISSION COUNTER. S. B. Gunst. Aug. 1955. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 44p. Contract AT-11-1-GEN-14. $7.80(ph OTS); $3.30(mf OTS).

A large fission chamber designed for high thermal-neutron sensitivity is described. Because of the large quantity of U electro-deposited on the electrodes, the α activity is sufficient to cause serious pulse pile-up (overlap in time) when the filling gas is 1% N_2 in A. Use of a faster filling gas of 10% CO_2 in A minimizes pulse pile-up within the fission chamber, but pile-up persists within the

electronics conventionally used to amplify fission-chamber pulses. Wide-band amplifiers and a fast crystal discriminator decrease the pulse pile-up within the electronics and increase the neutron sensitivity of the large fission counter a factor of $7\frac{1}{2}$ over the standard fission counter. The effect of adjustment of various parameters in the wide-band circuit is examined experimentally. Results are compared for the large and standard fission chambers with either of two filling gases and with either of two systems of electronics. Design considerations and recommendations are presented. (auth)

2613 WAPD-PM-28
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THIN SCINTILLATORS OF ZnS IN FUSED B_2O_3 FOR REACTOR NEUTRON MONITORING. J. C. Conner. Sept. 1955. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 22p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70 (mf OTS).

Thin scintillators of ZnS(Ag) in fused B_2O_3 capable of detecting thermal neutrons in the presence of intense γ ray backgrounds are described. A fabrication process is described which produces scintillators up to 5-inches in diameter and varying in thickness from 5 to 85 mils. The optimum thickness is shown to be close to 5 mils and the highest mass ratio of ZnS/B_2O_3 obtainable (8/9) has the greatest neutron sensitivity (3.5 CPS/nv). Radiation damage to the photomultiplier and scintillator is severe following reactor exposures. The difficulties associated with use of other scintillators for this application, such as LiI, are discussed in an appendix. (auth)

2614 WAPD-RM-109
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
ELEVATED TEMPERATURE TESTS ON THE MARK I BF PROPORTIONAL COUNTER. T. J. Walker, O. F. Swift, and R. T. Bayard. Mar. 1952. Changed from OFFICIAL USE ONLY July 18, 1956. 13p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

A Mark I BF_3 proportional counter was operated for 1500 hr at temperatures of 180 to 220°F. At the beginning of the test the counter decreased 10% in sensitivity when heated from 70 to 220°F. After several hundred hr of high-temperature operation, the counter stabilized and could be cycled between 70 and 220°F without changing its sensitivity more than ±2%. (auth)

Refer also to abstract 2553.

METEOROLOGY

2615 SC-2700A(TR)
Sandia Corp., Albuquerque, N. Mex.
MOISTURE CONTENT, DISTRIBUTION AND RADAR REFLECTIVITY IN THUNDERSTORMS. R. K. Moore, H. G. Oltman, A. T. Marrs, and D. M. Gragg. Nov. 9, 1953. Changed from OFFICIAL USE ONLY Apr. 12, 1956. 44p. $7.80(ph OTS); $3.30(mf OTS).

This report supersedes SC-2700(TR).

Measurements were made aloft of the distribution of drop sizes in thunderstorms, using a shadowgraph technique. Moisture content as high as 2.4 g per m^3 was deduced from the drop size data; this was nearly always in excess of 0.7 g/m^3. Values of radar cross-section index from 0.7 to 400 mm per m^3 were also deduced. Although the moisture content is of the same order of magnitude as that which has been reported by ground observers, the radar cross-section index is much lower. A graphical technique for determining the distribution function in a form suitable for extrapolation is also described in this report. (auth)

NEUTRONS

2616 KAPL-M-MLS-2
Knolls Atomic Power Lab., Schenectady, N. Y.
THE KRON ELECTRIC CIRCUIT MODEL AND ITS APPLICATION TO A PROBLEM IN NEUTRON DIFFUSION. M. L. Storm. July 20, 1954. 31p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The Kron electric circuit model representing the diffusion of neutrons in cylindrical (r,z) geometry is analyzed and correction factors for improving the accuracy of the model at interfaces are derived. Numerical results are presented for a specific problem of the diffusion of monoenergetic neutrons in a finite cylindrical reactor (side reflected but bare on top and bottom). The circuit model calculations were made by applying the method of tearing to the electric circuit model and results are in good agreement with the analytical solution to the problem. (auth)

2617 KAPL-M-RWD-6
Knolls Atomic Power Lab., Schenectady, N. Y.
EFFECTS OF NEUTRON ANGULAR ANISOTROPY AT THE BOUNDARY OF A BLACK REGION. R. W. Deutsch. Aug. 5, 1955. 11p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

Thermal and epithermal self-shielding factors have been derived for an infinite slab with an incident neutron angular distribution of the form $1 + \sqrt{3}\cos\theta/1 + \sqrt{3/2}$. These factors should more accurately represent a slab-type control rod adjacent to a fuel-moderator region than present schemes. (auth)

2618 LAMS-1090
Los Alamos Scientific Lab., N. Mex.
NOTE ON THE STATISTICAL THEORY OF MULTIPLICATIVE CHAINS. A. J. F. Siegert. Mar. 23, 1950. Changed from OFFICIAL USE ONLY July 18, 1956. 8p. Contract W-7405-eng-36. $1.80(ph OTS); $1.80(mf OTS).

Feynman's statistical theory of chains of identical neutrons is generalized to obtain a statistical theory of multiplicative chains of many classes of neutrons, the classes being defined by regions in phase space. (auth)

2619 WAPD-99
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
SPATIAL DISTRIBUTION OF THERMAL NEUTRONS FROM A POLONIUM–BERYLLIUM SOURCE IN WATER–ZIRCONIUM MIXTURES. William Baer. Dec. 1953. Changed from OFFICIAL USE ONLY July 18, 1956. 15p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The spatial distribution of thermal neutrons emitted by a Po–Be source and moderated by H_2O–Zr mixtures has been measured for four volume ratios. From these data, migration areas of source neutrons to energies below the Cd cut-off have been determined. (auth)

NUCLEAR PROPERTIES

2620 CF-52-3-16
Oak Ridge National Lab., Tenn.
NEUTRON DIFFRACTION AND ATOMIC DISTRIBUTION IN LIQUID LEAD AND LIQUID BISMUTH AT TWO TEMPERATURES. G. P. Smith and P. C. Sharrah. Mar. 5, 1952. Decl. Feb. 7, 1956. 14p. Contract W-7405-eng-26. $3.30(ph OTS).

Work was undertaken with the purpose of obtaining good diffraction patterns on liquid Pb and liquid Bi at two temperatures and to analyze these patterns in order to obtain the atomic distribution curve. These two elements have

conveniently large scattering cross sections. Bi and Pb are the only liquid metals which have previously been studied by neutron diffraction and, in the case of Pb, the results differ somewhat from those obtained by x-ray-diffraction methods. It was hoped that the neutron spectrometer available would be capable of giving a good pattern because of its intense monochromatic beam and the relative simplicity of obtaining experimental results. (auth)

2621 CF-54-1-25
Oak Ridge National Lab., Tenn.
THE CAPTURE OF POLARIZED NEUTRONS BY POLARIZED Sm^{149} NUCLEI. L. D. Roberts, S. Bernstein, J. W. T. Dabbs, and C. P. Stanford. [Jan. 1954]. 26p. Contract [W-7405-eng-26]. $0.25(OTS).

The Sm^{149} nuclei in the paramagnetic salt, semarium ethyl sulfate, were polarized by use of the hyperfine structure coupling, which was known to be large from paramagnetic resonance measurements. The Sm salt was placed in a field of 11,000 gauss after being cooled by thermal contact with a sample of iron ammonium alum which was demagnetized to zero field from 15,500 gauss and 1.2°K. The nuclear polarization was observed and measured by observations on the state of polarization of the neutrons transmitted by the Sm sample. A single crystal of magnetized magnetite, set to reflect neutrons of 0.07 ev in first order from the 220 planes was used as the analyzer. A nuclear polarization of about 0.12 was deduced from the data. The observed polarization direction of the transmitted neutrons gives $J = I + \frac{1}{2}$ for the 0.094-ev resonance level in Sm^{149}. A temperature of about 0.13°K for the Sm containing salt was deduced from the observed neutron polarization. (auth)

2622 CF-55-4-22
Oak Ridge National Lab., Tenn.
THE FISSION NEUTRON SPECTRUM OF U^{233}. K. M. Henry and M. P. Haydon. [April 1955]. 5p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

The U^{233} fission neutron spectrum between 1.3 and 10 Mev is presented graphically. (T.R.H.)

2623 IDO-16275
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
RESONANCE PARAMETERS IN TANTALUM. F. B. Simpson, R. G. Fluharty, and O. D. Simpson. Apr. 22, 1955. 11p. Contract AT(10-1)-205. (PPC-142). $3.30 (ph OTS); $2.40(mf OTS).

In a continuation of the Ta studies at the MTR, fast chopper transmission measurements have been used to determine parameters above 10 ev. New levels have been found at 23 and 36 ev. Sets of Breit-Wigner level parameters have been determined on five levels, and fairly constant values of Γ_γ are observed. The values of Γ_n have been determined for other levels, and the ratio $(\Gamma_n^0)/D$ will be discussed. From a combination of crystal and fast chopper spectrometer data, the resonance absorption integral has been calculated. (auth)

2624 IDO-16277
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
TOTAL NEUTRON CROSS SECTIONS OF Np^{237} IN THE 0.02 TO 3 EV REGION. M. S. Smith, R. R. Smith, E. G. Joki, and J. E. Evans. Apr. 22, 1955. 7p. Contract AT(10-1)-205. (PPC-150). $1.80(ph OTS); $1.80(mf OTS).

Previous MTR crystal spectrometer measurements, which provide evidence for the existence of a second natural Ta isotope, have demonstrated the feasibility of total cross section measurements on samples with macroscopic cross sections as small as 0.04 cm^2. When a 154 mg of Np became available, transmission measurements were made in the 0.02 to 3 ev region. The Np sample was a 0.5 cm^3 solution of the nitrate in D_2O. A special elevator-type sample changer provided for precise location of the sample in a Bragg beam 0.35 cm^2. Prominent resonances were found at 0.489, 1.34, and 1.49 ev. The Breit-Wigner parameters for the first resonance are $E_0 = 0.489 \pm 0.005$ ev, $\sigma_0 = 2600$ b, $\Gamma = 0.032 \pm 0.003$ ev, and $g\Gamma_n = 0.016$ mv. Values of $\sigma_0\Gamma$ for the 1.34 and 1.49 ev resonances are ~29 and ~140 ev·b respectively. (auth)

2625 KAPL-M-GMR-3
[Knolls Atomic Power Lab., Schenectady, N. Y.]
CURVES FOR CALCULATING EFFECTIVE AVERAGE FISSION OR ABSORPTION CROSS-SECTIONS AS REDUCED BY FOIL SELF-ABSORPTION AND DOPPLER BROADENING. Glenn M. Roe. Feb. 10, 1948. Decl. Feb. 8, 1956. 10p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

2626 KAPL-M-HB-2
Knolls Atomic Power Lab., Schenectady, N. Y.
DISCUSSION OF HANFORD α-EXPERIMENT WITH PROFESSOR H. A. BETHE. Harvey Brooks. Apr. 9, 1947. Decl. Feb. 6, 1956. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Experiments are discussed for determining the rate of spontaneous fission of Pu^{240}. A spontaneous fission count is believed to provide a method of Pu^{240} determination with no interference from Pu^{238}. (D.E.B.)

2627 KAPL-M-JBN-9
Knolls Atomic Power Lab., Schenectady, N. Y.
MULTIGROUP CROSS SECTIONS FOR RESONANCE ABSORBERS. J. B. Nims. [nd]. 12p. Contract W-31-109-Eng-52. $0.15(OTS).

An analytical formula for obtaining multigroup cross sections in terms of resonance parameters was derived and used for the resonance parameter for Hf^{177}, Hf^{178}, and HF^{179}. (F.S.)

2628 KAPL-M-RWD-3
Knolls Atomic Power Lab., Schenectady, N. Y.
INELASTIC NEUTRON SCATTERING OF ZIRCONIUM. R. W. Deutsch. Apr. 27, 1955. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The inelastic cross section has been determined for Zr by means of a simplified theoretical treatment. The subsequent inelastic neutron spectrum has been determined for use in multigroup calculations. Also, the removal cross section for fast effect calculation has been calculated. (auth)

2629 UCRL-868
California. Univ., Berkeley. Radiation Lab.
HIGH ENERGY EXCITATION FUNCTIONS IN THE HEAVY REGION. W. W. Meinke, G. C. Wick, and G. T. Seaborg. Sept. 26, 1950. Changed from OFFICIAL USE ONLY June 26, 1956. 68p. Contract W-7405-eng-48. $10.80(ph OTS); $3.90(mf OTS).

The electrostatically deflected beam of the 184-inch cyclotron has been used with the stacked foil and absorber technique to determine the excitation functions for the following reactions: $Th^{232}(p,6n)Pa^{227}$, $Th^{232}(p,3n)Pa^{230}$, $Th^{232}(d,7n)Pa^{227}$, $Th^{232}(\alpha,p8n)Pa^{227}$, $Th^{232}(\alpha,p5n)Pa^{230}$, and $U^{238}(p,\alpha8n)Pa^{227}$. The data are presented graphically and discussed individually for each of the reactions. Some rough excitation function data have also been determined for the reactions $Th^{232}(d,4n)Pa^{230}$, $U^{238}(p,\alpha5n)Pa^{230}$, $Th^{232}(\alpha,7n)U^{229}$, and $Th^{232}(\alpha,6n)U^{230}$. The results are discussed in terms of compound nucleus formation, trans-

parency effects, and other factors in order to arrive at a qualitative picture for the mechanism of high energy nuclear reactions with heavy nuclei. (auth)

NUCLEAR REACTORS

2630 AECD-3669
Michigan. Univ., Ann Arbor. Michigan Memorial-Phoenix Project.
THE NUCLEAR RESEARCH REACTOR AT THE UNIVERSITY OF MICHIGAN: AN EVALUATION OF THE HAZARDS OF OPERATION AND PROVISIONS FOR LIMITING THESE HAZARDS. William K. Luckow, Russell B. Mesler, and Lawrence C. Widdoes. Apr. 22, 1954. Decl. Feb. 29, 1956. 30p. Contract AT(11-1)-224. (MMPP-75-2). $4.80(ph OTS); $2.40(mf OTS).

A hazards evaluation of the proposed Michigan Research Reactor is made for the case of a maximum credible accident, which is believed to be the dissolution of the fuel elements and subsequent release of fission products to the pool water. Factors affecting the radiation doses within and outside a specially designed reactor building are discussed. (K.S.)

2631 AECD-3996
Oak Ridge National Lab., Tenn.
DECOMPOSITION OF WATER AT HIGH TEMPERATURES AND PRESSURES UNDER REACTOR IRRADIATION. L. W. Fromm. Sept. 16, 1949. Decl. with deletions Jan. 5, 1956. 24p. Contract W-7405-eng-26. $0.25(OTS).

The investigation of the high temperature and pressure dissociation of water under irradiation was undertaken in an effort to determine the degree of importance of the phenomenon with respect to the design of a high-temperature water-cooled power reactor. Theory and past experimentation indicate that net steady-state dissociation is determined by the rates of the dissociation and recombination reactions under the imposed conditions, the dissociation rate being essentially a function of flux and the recombination rate essentially a function of temperature. A static electrically-heated autoclave and associated temperature controlling, pressure recording, filling, purging and sampling apparatus was constructed and the autoclave installed in a test hole of the X-10 reactor under an approximate thermal flux of 5×10^{11} neutron/cm^2-sec. Two data runs were made, one at 350°F and one at 450°F, on water with a gas phase of saturated steam. Neither run showed any significant increase in pressure throughout, and analyses of the water phase indicated very slight gas formation easily attributed to autoclave corrosion. Under the conditions of flux and temperature of these experiments, the recombination rate is considerably higher than the dissociation rate. Several attempts were made to determine whether or not gaseous H and O added to the gas phase would dissolve and enter into the recombination reaction, but inconsistent leaks in the system valving developed, rendering the data worthless. At present the valving is being rebuilt, and these experiments will be repeated. In a future experiment, investigation at higher fluxes will be carried out through the replacement of the present autoclave by one incorporating an outer jacket of U. (auth)

2632 ANL-4354(Del.)
Argonne National Lab., Lemont, Ill.
REACTOR ENGINEERING DIVISION REPORT FOR THE PERIOD JUNE 1, 1949 THROUGH AUGUST 31, 1949. Oct. 7, 1949. Decl. with deletions Dec. 8, 1955. 10p. Contract W-31-109-eng-38. $1.80(ph OTS); $1.80(mf OTS).

The design and performance of a d-c electromagnetic pump are reported. Operational experience from CP-3 is reviewed. (D.E.B.)

2633 BNL-14
Brookhaven National Lab., Upton, N. Y.
NUCLEAR REACTOR PROJECT PROGRESS REPORT. Jan. 1, 1948. Decl. Sept. 21, 1956. 99p. $15.30(ph OTS); $5.40(mf OTS).

2634 BNL-18
Brookhaven National Lab., Upton, N. Y.
REPORT ON THE BROOKHAVEN NUCLEAR REACTOR PREPARED FOR REACTOR SAFEGUARD COMMITTEE OF THE ATOMIC ENERGY COMMISSION. L. B. Borst. June 22, 1948. Decl. Sept. 19, 1956. 186p. $0.80(OTS).

General design features of the Brookhaven Reactor are described. Photographs of the site and partially completed buildings are included. Tabulated data compare the Brookhaven and the Clinton reactors. Detailed information is presented on the following features of the Brookhaven Reactor: nuclear characteristics; startup and shutdown; control rod drive equipment; reactor instrumentation; metal protection; equipment and operation of the helium system; efficiency and servicing of the filter system; metal storage in and contamination of the canal; the cooling system; the electrical power system; meteorology and radiation protection; and a survey of natural catastrophies as a possible source of trouble. (C.H.)

2635 BNL-18(Suppl.)
Brookhaven National Lab., Upton, N. Y.
SUPPLEMENT TO REPORT ON THE BROOKHAVEN NUCLEAR REACTOR PREPARED FOR REACTOR SAFEGUARD COMMITTEE OF THE ATOMIC ENERGY COMMISSION. L. B. Borst. Aug. 30, 1948. Decl. Sept. 21, 1956. 133p. $19.80(ph OTS); $6.30(mf OTS).

Factors affecting the operating safety of the Brookhaven Reactor on which data are presented include: a survey on the possibility of earthquakes; a survey on the procedure used for fabrication of the fuel cartridge; the performance of leak test equipment; procedures for the transfer of radioactive material from the canal and heat generation in the canal; procedures for handling liquid wastes; a survey of meterological data and their relationship to pile operation; a survey of procedures for startup of the reactor; high-level operating procedures; and procedures for scheduled and emergency shutdowns. (C.H.)

2636 BNL-1575
Brookhaven National Lab., Upton, N. Y.
ϵ MEASUREMENTS. H. Kouts and G. Price. Feb. 19, 1953. Decl. May 3, 1956. 7p. $1.80(ph OTS); $1.80 (mf OTS).

The experimental method and results of fast fission factor measurements on reactor fuel rods containing U^{238} are discussed. (D.E.B.)

2637 BNL-2743
Brookhaven National Lab., Upton, N. Y.
THE FAST EFFECT. B. Mozer. June 11, 1954. Decl. Feb. 7, 1956. 5p. Contract AT(30-2)-gen-16. $1.80(ph OTS); $1.80(mf OTS).

The average fast effect for light H_2O-moderated hexagonal lattices is calculated and reported. (T.R.H.)

2638 CF-50-1-18
Oak Ridge National Lab., Tenn.
NEUTRON FLUXES AND HEAT PRODUCTION IN THE TOP AND SIDE THERMAL SHIELDS OF THE MATERIALS TESTING REACTOR. R. B. Briggs. Jan. 6, 1950. Decl. Sept. 13, 1956. 10p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

2639 CF-51-8-53
Oak Ridge National Lab., Tenn.
OSCILLATION OF FLUID LEVEL IN SOUP DUMP LINE. T. A. Welton. Aug. 7, 1951. Decl. Feb. 7, 1956. 3p.

Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

In the HRE, the liquid level in the soup dump line can fluctuate, the line being partially filled with decomposition gas. The equilibrium amplitude of pressure oscillations is estimated at 100 #/in.^{2} To prevent this a simple design change is proposed. (T.R.H.)

2640 CF-51-8-287
Oak Ridge National Lab., Tenn.
PERFORMANCE OF LET-DOWN SYSTEM OF THE HRE. J. M. Smith and D. L. Katz. Aug. 30, 1951. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 22p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The data obtained on the mock-up of the let-down system for the HRE are analyzed with respect to the oscillation problem. Figures are included showing the range of conditions where oscillation and steady-state operation occur. An attempt has been made to explain the cause of oscillation in terms of the properties of two-phase flow. The importance of the geometry of the system, particularly the exchanger and pressurizer, is emphasized. (auth)

2641 CF-51-10-87
Oak Ridge National Lab., Tenn.
COMPARISON OF STRAIGHT THROUGH AND ROTARY FLOW IN FIFTEEN FOOT SPHERES. I. Spiewak. Oct. 12, 1951. Decl. Feb. 9, 1956. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Rotary-, straight through-, and rotary-straight through-type reactors are considered in a study directed toward future development of hydrodynamics of spherical reactors. Minimum pressure drop, minimum gas holdup, maximum stability of flow pattern and gas distribution, and adequate removal of heat from all parts of the reactor are the achievements sought. (T.R.H.)

2642 CF-51-10-165
[Oak Ridge National Lab., Tenn.]
EFFECT OF DENSITY DIFFERENCES ON FLOW IN THE HRE CORE. I. Spiewak and J. O. Bradfute. Oct. 17, 1951. Decl. Feb. 9, 1956. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The behavior of the HRE core tank under the influence of a density difference has been investigated in the full scale plastic model. This work has allowed the estimation of a maximum temperature in the characteristic stagnant region of 275.6°C, for the proposed operating level of 1 Mw and 250°C outlet temperature. This is felt to permit operation of the reactor at, or close to, the design point. It was found that the major cooling mechanisms were liquid mixing, convection caused by density gradients and the effect of bubbles. These are described quantitatively in the report. (auth)

2643 CF-53-6-158(Del.)
Oak Ridge National Lab., Tenn.
THE INFLUENCE OF THE METHOD OF CALCULATING RESONANCE CAPTURE ON THE FAST LEAKAGE IN BREEDERS. M. Tobias and M. C. Edlund. June 16, 1953. Decl. with deletions Dec. 9, 1955. 21p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Resonance capture was calculated using a physical method which approximates the effect of localized resonance. Results show that for reactors of the dimensions and constants being considered, the over-all effect upon the neutron balance is significant in the case of a 6-ft, diameter core reactor with a one-foot blanket. Leakage is five times as large as given by previous two-group calculations. A 2-ft blanket will render negligible leakage losses. (F.S.)

2644 CF-53-11-25
Oak Ridge National Lab., Tenn.
RELEASE TIME INVESTIGATION OF THE OAK RIDGE RESEARCH REACTOR SHIM ROD SUPPORT. L. C. Oakes. Dec. 8, 1953. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The total time required for the Oak Ridge Research Reactor shim rod to start moving after the initiation of a scram is 7.7 msec (electrical delay) plus 10 msec (average mechanical delay)—a total of 17.7 msec. (auth)

2645 CF-54-3-174
Oak Ridge National Lab., Tenn.
HRT CRITICALITY CALCULATIONS—D_2O REFLECTOR AND 633 Gm/Kg·D_2O THORIUM—D_2O BLANKET. Phillip M. Wood. Mar. 25, 1954. 3p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

2646 CF-54-4-194
Oak Ridge National Lab., Tenn.
STEAM SYSTEM FOR THE HRT—A STUDY. R. C. Robertson. Apr. 28, 1954. Decl. Feb. 9, 1956. 39p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Six possible arrangements for the HRT steam system are discussed with rough cost estimates for each compared with generating capacity. General factors involved in selecting a steam system for 6.6-Mev reactor power are covered. A cooling tower, fan, and circulating pump appear to be justified. Feedwater pumping would be about 45 gpm. A 1000-gal feedwater storage tank is recommended, and a steam drum to provide hold-up time is required. (F.S.)

2647 CF-54-4-220
Oak Ridge National Lab., Tenn.
STUDY OF DUMP TIMES, EQUILIBRIUM PRESSURES AND MINIMUM DISCHARGE CAPACITIES OF PROPOSED LOW PRESSURE DUMP TANK SYSTEMS. C. L. Segaser. Apr. 6, 1954. Decl. Feb. 8, 1956. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Two possible ways of obtaining a transient equilibrium pressure in the low pressure system are discussed in a study of dump times and minimum discharge capacity of the HRT. (F.S.)

2648 CF-54-5-2
Oak Ridge National Lab., Tenn.
HRT EVAPORATOR DESIGN STUDY. C. L. Segaser. May 3, 1954. Decl. Feb. 8, 1956. 13p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The design of a standard calandria-type of shell and tube evaporator is discussed, and the specifications are included for use in the HRT. (F.S.)

2649 CF-54-5-246
Oak Ridge National Lab., Tenn.
CONTROL PANEL MOCK-UPS. R. L. Moore. May 18, 1954. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

The factors influencing the layout of the graphic and non-graphic control panel for the HRE are discussed. (F.S.)

2650 CF-54-6-222
Oak Ridge National Lab., Tenn.
DECOMPOSITION GASES RELEASED DURING A DUMP OF HRT. R. E. Aven. June 25, 1954. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

2651 CF-54-8-167
Oak Ridge National Lab., Tenn.
INNER DUMP TANKS, THEIR PIPING AND SUPPORTS. R. G. Pitkin. Aug. 17, 1954. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

The relation of the inner dump tanks to their supports and piping in the HRT was studied with regard to stress and weight requirements. (F.S.)

2652 CF-54-10-63
Oak Ridge National Lab., Tenn.
INNER DUMP TANK PIPING AND WEIGHING SYSTEM. R. G. Pitkin. Oct. 13, 1954. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The proposed arrangements of the inner dump tanks, piping, and inventory weighing system for the HRT are outlined briefly. (B.J.H.)

2653 CF-54-12-151
Oak Ridge National Lab., Tenn.
PROBLEMS AND STATUS OF ThO_2 BLANKET DEVELOPMENT. R. N. Lyon. Dec. 20, 1954. Decl. Apr. 4, 1956. 13p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40 (mf OTS).

2654 CF-55-1-29
Oak Ridge National Lab., Tenn.
DESIGN CRITERIA FOR HRT SAMPLE LINE COOLERS. R. Van Winkle. Jan. 5, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

2655 CF-55-1-49
Oak Ridge National Lab., Tenn.
BAYONET TUBE REFLUX CONDENSER FOR THE HRT OUTER DUMP TANKS. Charles L. Segaser. Jan. 4, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The calculated pressure drops and required surface area versus cooling water flow velocity for a bayonet-tube type reflux condenser for the HRT outer dump tanks are given. (F.S.)

2656 CF-55-2-75
Oak Ridge National Lab., Tenn.
HRT SAFETY CALCULATIONS. Paul R. Kasten. Feb. 14, 1955. Decl. May 25, 1956. 18p. Contract [W-7405-eng-26]. $0.20(OTS).

The effect of blanket material upon reactor safety has been investigated for the HRT. The results are given in terms of rates of reactivity addition corresponding to a given core pressure rise as a function of the average lifetime of prompt neutrons and initial critical conditions. It was found that for a given pressure rise the allowable rate of reactivity addition was relatively insensitive to the average lifetime, although the rate decreased somewhat with decreasing lifetime for the higher pressure rises. With only source neutrons present and the reactor subcritical initially, the allowable rate was practically independent of the value of the initial value of k_e. For core pressure rise of 400 psi, the corresponding rate of reactivity addition was about 0.8%/sec. For a pressure rise of 4000 psi, the rate was 2.5 to 3.0%/sec. (J.E.D.)

2657 CF-55-2-128
Oak Ridge National Lab., Tenn.
THERMAL STRESS IN HRT PRESSURE VESSEL. R. E. Aven. Feb. 21, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 17p. Contract [W-7405-eng-26]. $0.20(OTS).

By deriving equations and making plots relating temperature in the pressure vessel wall with time, it is possible to compute the rate at which the surface temperature is changing for various temperature differences between the inside and outside surfaces. From this value it is possible to calculate thermal stresses in the pressure vessel wall. The results are presented. It is recommended that when the pressure vessel is heated or cooled, the temperature difference across the wall be limited to a maximum of 50°F. This will limit the rate of surface heating to 260°F per hr and the thermal stress to 10,000 psi. (auth)

2658 CF-55-3-57
Oak Ridge National Lab., Tenn.
BOILING BLANKET FOR TBR—POWER UTILIZATION. P. C. Zmola. Mar. 9, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 4p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

2659 CF-55-3-178
Oak Ridge National Lab., Tenn.
HRP-CP: PRELIMINARY DESIGN STUDY OF THE PROPOSED PLUTONIUM LOOP. W. L. Carter. Mar. 21, 1955. Decl. Apr. 4, 1956. 10p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Requirements, safety factors, location, cost and manpower estimates, design, and flowsheets for the loop for investigating the behavior of $Pu(SO_4)_2$ at reactor conditions is presented. (T.R.H.)

2660 CF-55-4-24
Oak Ridge National Lab., Tenn.
DEFORMATION OF MTR FUEL ELEMENT IN STATIC PRESSURE TESTS. J. P. Sanders. Apr. 22, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. $6.30 (ph OTS); $3.00(mf OTS).

Changes in deflection with internal pressure for a number of side plate and fuel plate thicknesses in the MTR fuel element are observed. Increases in side plate strength are more effective than increases in fuel plate thickness in the prevention of deflection. (D.E.B.)

2661 CF-55-5-51
Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR SAFETY. P. R. Kasten. May 9, 1955. 26p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Reactors which have a negative power coefficient of reactivity have been termed inherently safe because any increase in reactivity results in a power increase which in turn reduces reactivity. The safety of any reactor is determined by the effects of a rapid and large increase in reactor power. The rate of power increase and the maximum reactor power attained is a function of the reactivity addition, the particular system, the magnitude of the power coefficient, and the average lifetime of prompt neutrons. The effective reactivity addition is a function of the time rate at which reactivity is added, the power level at which the reactor becomes prompt critical, the power coefficient of reactivity, and the average lifetime of prompt neutrons. The initial neutron power level of the reactor is a function of the previous operational history, and/or the strength of any neutron source present. The above relations are obtained and their usefulness in evaluating the safety of a given reactor design is indicated. (auth)

2662 CF-55-5-1[illegible]
Oak Ridge National Lab., Tenn.
HYDRAULIC AND THERMAL CHARACTERISTICS OF THE ORR CORE. F. T. Binford. May 27, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The average velocities and flow rates at the outside and annuli of the reflector and on the outside and inside of the fuel elements and shim rods in the ORNL Research Reactor are reported. (F.S.)

2663 CF-55-5-189
[Oak Ridge National Lab., Tenn.]
PRELIMINARY CRITICAL TESTS USING AQUARIUM FUEL ELEMENTS IN THE BSR GRID. K. M. Henry,

E. B. Johnson, and F. C. Maienschein. May 31, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80 (mf OTS).

Preliminary critical tests for the Aquarium reactor were performed in the BSR grid, in attempts to determine minimum critical mass and excess reactivity. The critical mass of Aquarium elements was lower than estimated but higher than BSR elements. (T.R.H.)

2664 CF-55-7-95
Oak Ridge National Lab., Tenn.
PRESSURE RISE INSIDE HRT THERMAL SHIELD IN EVENT OF PRESSURE VESSEL FAILURE. R. E. Aven. July 20, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

2665 CF-55-7-115
Oak Ridge National Lab., Tenn.
HEAT GENERATION AND TEMPERATURE DISTRIBUTION IN CONTROL ROOM SHIELD WALL. P. N. Haubenreich. July 27, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The shield wall between the control area and the reactor cell is a 5½-ft thick tank filled with a mixture of colemanite, barytes aggregate, and water. Heat is generated in the shield by absorption of gamma rays from the reactor and gamma rays and alpha particles resulting from neutron capture within the shield itself. Because of the two-foot thick thermal shield around the reactor vessel, the radiation entering the wall is not sufficiently intense to cause a serious temperature rise. Thus there appears to be no need for internal cooling. The temperature distribution through the wall in the region of greatest heat production is plotted. These curves are based on heat transfer coefficients at the two surfaces of 0.5 Btu per hr ft^2 °F, which is appropriate for transfer to still air. A maximum temperature of 160°F at 10 Mw is indicated. If the air moves past the face of the wall with appreciable velocity, coefficients of 1 Btu per hr ft^2 °F will be more appropriate, and the maximum temperature in the wall at 10 Mw will be 149°F. (auth)

2666 CF-55-7-134
Oak Ridge National Lab., Tenn.
ENERGY ABSORPTION RATE AND TEMPERATURE DISTRIBUTIONS IN THE REACTOR TANK AND EXPERIMENTAL FACILITIES. J. P. Sanders. July 29, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1955. 20p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Based on experimental data for the energy absorption rate at the core face of the ORNL Research Reactor, the energy absorption rate in the experimental facility liners and tank components were estimated in order to prevent excessive thermal stresses. (F.S.)

2667 CF-55-8-42
Oak Ridge National Lab., Tenn.
FLOW IN COOLING CHANNELS OF THE LARGE FACILITY AND BEAM HOLE LINERS AND CORE HOUSING. J. P. Sanders. Aug. 8, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculation of the maximum temperatures which may be expected in the Al liners of the large experimental facilities and beam holes and in the core housing of the ORNL Research Reactor assumed that an over-all heat transfer coefficient of 2,000 Btu/hr-ft^2-°F would be obtained at those surfaces cooled by forced convection. It has been estimated that the scale coefficient for these surfaces would be at least 4,000 Btu/hr-ft^2-°F, and therefore the "liquid film" coefficient must be at least 4,000 Btu/hr-ft^2-°F. Based on this value, the empirical equation $h_f = 150\ (1 + 0.011\ t)\ (V')^{0.8}/(D')^{0.2}$ may be used to predict the minimum velocity, V', which must be attained in each cooling channel in order to insure a "film" coefficient of this magnitude. In addition, through the use of empirical formulae relating velocity and pressure loss for flow in channels, the velocities which may be expected in the unrestricted channels, as presently designed, were calculated. Corresponding to these velocities, the total flow in the cooling channels of the facilities and core housing were calculated. (auth)

2668 CF-55-8-87
Oak Ridge National Lab., Tenn.
AN ESTIMATE OF THE HEAT PRODUCTION RATE IN THE THORIUM OXIDE SLURRY BLANKET OF THE HRT. D. G. Thomas. Aug. 5, 1955. Decl. Apr. 13, 1956. 8p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

2669 CF-55-8-107
Oak Ridge National Lab., Tenn.
PURGE WATER REQUIRED FOR ABSORPTION OF RADIOLYTIC GAS GENERATED IN PRESSURIZER. R. E. Aven. Aug. 16, 1955. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A safe purge water rate for the HRT pressurizers was estimated as a function of the D_2 concentration which can be tolerated in the gas phase of the pressurizer. The calculated values for purge rates are low for D_2 concentrations > 1 mol per cent in the gas phase. A purge rate of 10 gph is recommended as being sufficient to prevent explosive concentrations of D_2 and O_2 from building up in the gas space of the pressurizer. (F.S.)

2670 CF-55-9-8
Oak Ridge National Lab., Tenn.
REACTOR STUDIES IN TWO DIMENSIONS AND TWO REGIONS. C. L. Bradshaw. Sept. 6, 1955. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A simple model to be used for reactor calculations in two dimensions is described. Included are discussions of the boundary conditions, pertinent differential equations and corresponding difference approximations, and numerical solutions of the difference system. (B.J.H.)

2671 CF-55-9-47
Oak Ridge National Lab., Tenn.
FEASIBILITY OF HIGH-PRESSURE NATURAL CIRCULATION CATALYTIC RECOMBINERS FOR RADIOLYTIC GASES. R. E. Aven. Sept. 21, 1955. Changed from OFFICIAL USE ONLY July 12, 1956. [Contract W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A study has been made to determine if the driving force due to differences in gas densities at high pressure is sufficient to permit the design of a reasonable natural circulation catalytic recombiner for high power reactors. The only significant pressure drops in the design, considered here, lie in the pellets of the catalyst bed and the wire mesh of the entrainment separator. By designing the catalyst bed with a large flow area, it is possible to reduce the total pressure drop to reasonable values, particularly at the higher pressures (~2000 psia). (auth)

2672 CF-55-10-14
Oak Ridge National Lab., Tenn.
REPORT ON ANALYSIS OF DATA OBTAINED FROM THE HRT DUMP TEST, PHASE I. P. F. Pasqua. Oct. 6, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Pressure-time relationship in a reactor core and blanket, after the dump valve was fully opened, can be

predicted if the heat transfer to the liquid is negligible and the enthalpy of the fluid flowing out of the vessel is constant in the interval of time $\Delta\theta$. (F.S.)

2673 CF-55-10-43
Oak Ridge National Lab., Tenn.
REDUCED POWER OPERATION OF REACTOR PLANT TURBINE-GENERATOR COMBINATION—TBR NO. 1. W. F. Taylor and M. C. Lawrence. Oct. 31, 1955. 19p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

In order to reduce the effect of reactor system component failures on plant on-stream efficiencies, it is proposed to study modifications of the TBR layout wherein the main circulating loops are divided into several "part capacity" loops. The first phase of this study involves consideration of the effects of utilizing four core system heat exchangers in parallel, each of these exchangers being of the same size as the blanket heat exchanger. From this study it is readily evident that manifolding of reactor system components is economically desirable (even necessary) until such time as the design of reactor equipment approaches the degree of reliability now attainable in modern turbogenerator components. Thus the development of suitable block valves and provisions in station layout for isolation components without shutting down the station might be a highly paying proposition even where only a few heat exchangers are manifolded. (auth)

2674 CF-55-12-48
Oak Ridge National Lab., Tenn.
EFFECT OF HEAT GENERATION ON DUMPING OF HRT. M. W. Rosenthal and H. C. Claiborne. Dec. 7, 1955. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A preliminary estimate of the effect of heat generation (from decay of the chain reaction and fission products) on an HRT dump has been made. With heat generation and no venting of overpressure, the core pressure appears to fall from 2000 to 1500 psia in about 30 seconds and then to decrease 200 psi during the remainder of the period of liquid expulsion. If the core system were neither vented nor dumped following complete cessation of heat removal, the pressure would rise from compression of the pressurizer vapor by liquid expansion and would attain 2800 psia in approximately 40 seconds. (auth)

2675 CF-3599
Argonne National Lab., Lemont, Ill.
THE CRITICAL SIZE OF A CYLINDRICAL PILE HAVING A VERTICAL TEMPERATURE GRADIENT. R. J. Finkelstein. Aug. 19, 1946. Decl. Jan. 5, 1956. 9p. Contract W-31-109-eng-38. $0.15(OTS).

The critical dimensions of a cylindrical pile with a vertical temperature gradient are calculated. If the temperature gradient is of the order of 5°/cm, approximately the value contemplated for the BeO pile, then the critical dimensions may be calculated by assuming that the temperature of the pile is constant and equal to its arithmetical mean. (auth)

2676 CP-2048
Clinton Labs., Oak Ridge, Tenn.
EXPONENTIAL EXPERIMENTS WITH WATER-METAL ROD LATTICES. Preliminary Report [on] Problem Assignment 303-X25P. T. Arnette, S. Bernstein, G. Branch, F. Byerly, C. Clifford, B. Feld, Haydn Jones, R. McCord, H. W. Newson, W. Myer, F. V. Pruitt, R. B. Stewart, J. R. Rush, R. Scalletar, L. Slotin, and L. B. Watson. Oct. 3, 1944. Decl. Dec. 14, 1955. 27p. Contract [W-7405-eng-39]. $0.25(OTS).

Measurements on twelve water metal lattices ranging in water to metal volume ratio from 3.27 to 0.273 are reported here. The values for k lay between 0.6 and 1.00 With the materials used and no gap, a k greater than 1.00 does not seem to be obtainable. By introducing a gap and decreasing the rod size, it may be possible to build a lattice having a k greater than one. (auth)

2677 CP-2273
[Chicago. Univ.] Metallurgical Lab.
MAXIMUM FORCE OF A WARPED ROD AGAINST A RIGID CONSTRAINT. A. V. Martin. Oct. 26, 1944. Decl. Feb. 16, 1956. 7p. Contract [W-7401-eng-37]. $1.80(ph OTS); $1.80(mf OTS).

2678 HKF-3
Ferguson (H. K.) Co., Inc., New York.
BORON STEEL FOR BROOKHAVEN NATIONAL LABORATORY. F. R. Kemmer. Apr. 1, 1949. Decl. Sept. 21, 1956. 51p. For Brookhaven National Lab. Contract AT-30-2-GEN-16, [Subcontract] A-E-M- S-26. $0.40(OTS).

The pile at Brookhaven National Laboratory will be controlled through the operation of sixteen boron steel bars which will be inserted horizontally into the pile. Each of the control rods will be operated through a toothed rack mechanism to which each control rod is attached. The end section of the toothed rack will be spliced to one end of the boron steel rod. The boron steel control rods for the Brookhaven pile are much longer than any boron steel control rod made in the past. The boron content is higher than that used heretofore and an unexpected new requirement developed with respect to manganese content. A maximum content of 0.10% manganese was specified but the aim was preferably to make heats of steel containing boron with practically zero manganese content. This new requirement on manganese resulted from the fact that at least one of the manganese isotopes is radioactive. Chemical specifications and heat analysis data are presented for boron steel for use in these boron steel control rods. (C.H.)

2679 HW-26566
Hanford Works, Richland, Wash.
A CRITICAL ASSEMBLY FOR THE MEASUREMENT OF LATTICE REACTIVITY. J. Ozeroff. Dec. 16, 1952. Decl. Jan. 7, 1956. 10p. Contract [W-31-109-eng-52]. $0.15(OTS).

A qualitative discussion is given of a method for measuring the reactivity of graphite U lattices by insertion of a portion of lattice into the core of a specially designed critical assembly. (auth)

2680 HW-29453
Hanford Atomic Products Operation, Richland, Wash.
MULTIPLICATION OF ENRICHED LOADING IN EXPONENTIAL PILE. W. B. Farrand and R. C. Lloyd. Sept. 28, 1953. Decl. Feb. 20, 1956. 13p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Increasing the flux level of the exponential piles by spiking the lower portion of the piles with enriched material was found to be unfeasible because the necessary amount of enriched material is too large for the AEC and the "buffer layer" between the enriched portion measurement region becomes very thin, allowing unpredictable flux perturbations to negate experimental measurements. Other methods of increasing the flux level are suggested. (F.S.)

2681 HW-33108
Hanford Atomic Products Operation, Richland, Wash.
RESONANCE CAPTURE BY A STANDARD HANFORD NAUTRAL-URANIUM SLUG. R. K. Cole. Sept. 20, 1954. Decl. Jan. 31, 1956. 7p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The small source parameter γ, the resonance blackness constant, was found and used to calculate the resonance

escape probability. Values for the resonance escape probability were found for various lattices using a Hanford natural-U slug. (F.S.)

2682 HW-35746
Hanford Atomic Products Operation, Richland, Wash.
PROPOSED CLEAN-UP SYSTEM FOR CARBON STEEL HIGH TEMPERATURE RECIRCULATION SYSTEM. W. L. Pearl. Mar. 17, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A cyclone separator system is described for water clean-up of high-temperature recirculating reactor cooling systems. (T.R.H.)

2683 HW-36503
Hanford Atomic Products Operation, Richland, Wash.
SPECTRAL HARDENING CORRECTION TO η. E. E. Jones. May 2, 1955. Decl. Feb. 2, 1956. 3p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Two methods for calculating the reduction in η due to spectral hardening have been used. In the first method it is assumed that the absorption cross section of U^{238} is 1/v. This indicates no change in η within the error of the calculation. In the second it is assumed that the scattering cross section of uranium is constant. A decrease in η of 3.0% at the centerline of the slug is indicated by this calculation. The assumption that U^{238} is a 1/v absorber is regarded as the more reasonable of the two. (auth)

2684 HW-37811
Hanford Atomic Products Operation, Richland, Wash.
STAINLESS STEEL CONNECTOR EVALUATION. Final Report. C. A. Mansius and J. R. Spink. July 8, 1955. 27p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Results of tests show that the standard five bend connector made from Type 304 stainless steel 0.065 inch wall tubing, in the as bent condition, with either Cd-plated Parker brass nuts and sleeves or Cd-plated high carbon steel nuts and sleeves, is suitable for installation on K reactors. (auth)

2685 HW-38583
[Hanford Atomic Products Operation, Richland, Wash.]
ALTERNATE ACID ADDITION FACILITY FOR 100-K. W. D. Bainard. Aug. 23, 1955. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

An alternate H_2SO_4 addition facility for pH adjustment of Hanford coolant is suggested. The rate of acid addition is controlled by means of needle valves. (See also HW-33178.) (auth)

2686 HW-38838
Hanford Atomic Products Operation, Richland, Wash.
COMPUTATION OF THE RESONANCE ESCAPE PROBABILITY FOR DRY GRAPHITE–URANIUM ROD LATTICES. I. THEORY. H. Neumann. Sept. 1, 1955. 12p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A method for calculating the resonance escape probability for rod lattice assemblies is presented. No use is made of the usual diffusion model, which involves fictitious flux patterns and effective widths for the entire resonance band. Temperature coefficients are to be computed by use of appropriate Doppler-modified cross sections. While the usual gas model for the target nuclei is assumed to develop these Doppler cross sections, it is not assumed (as is usual) that the neutron mass is negligible compared with the nucleus mass, and the potential-internal interference minima in the scattering cross section are explicitly accounted for. Numerical results will be presented in a second report under the present title. (auth)

2687 HW-39445
[Hanford Atomic Products Operation, Richland, Wash.]
INVESTIGATION OF THE CAUSES OF WELD REJECTS. G. L. Otterbein. Oct. 11, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 13p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Investigations were initiated to determine the causes for defective welding in the canning of fuel elements. (W.L.H.)

2688 HW-39605
[Hanford Atomic Products Operation, Richland, Wash.]
MATERIALS COSTS FOR NICKEL PLATING. W. B. Kerr. Oct. 21, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 3p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS)

The approximate cost of Ni plating 1,000 eight-in. solid U fuel elements on a production basis is $44.17. Each slug loses ~44.5g of U; each used solution would contain about 32.5 lb. of U. (T.R.H.)

2689 IDO-16007
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
A METHOD FOR ESTIMATING PERTURBATIONS DUE TO FISSIONABLE MATERIALS NEAR THE MTR CORE. H. L. McMurry. May 9, 1952. Changed from OFFICIAL USE ONLY June 20, 1956. 23p. Contract [AT(10-1)-205]. $4.80(ph OTS); $1.70(mf OTS).

A method is developed for computing the perturbations of the flux distribution and reactivity of the MTR by the introduction of vertical rods of fissionable material inside the reactor tank. The method is based on calculations of a simulated system with calculable geometry. In particular, a cylindrical core reactor with a parallel cylindrical source embedded in the reflector is analyzed theoretically to develop a method for estimating the effect of placing a "flux booster" in front of a beam hole. (auth)

2690 IDO-16042(Del.)
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
FIRST FOUR MTR FUEL LOADINGS—SOME OPERATING DATA. RELATIVE COOLING-WATER FLOW AND TEMPERATURE RISE AMONG INDIVIDUAL FUEL ASSEMBLIES ALONG WITH CALCULATED FUEL BURN-UP DISTRIBUTIONS. G. H. Hanson. May 15, 1953. Decl. with deletions Dec. 7, 1955. 30p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS).

During the first four MTR fuel loadings a considerable amount of data was obtained concerning the temperature rise of the cooling water across the individual fuel assemblies and the relative flows through each. These data are summarized and fuel burnup distributions are calculated. Within a row of fuel assemblies, particularly with a 3 × 9 lattice, the burn-up is greatest in the center and least on the ends. In addition, with the 3 × 9 arrangement the fuel consumption of those assemblies on the west was usually greater then than that for the elements on the east. The variation between the various rows was quite small. These fuel burn-up distributions are compared with those obtained from flux maps and γ-ray surveys. (auth)

2691 IDO-16080
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
MTR FLUX CALIBRATION UNIT. C. H. Hogg and R. H. Lewis. May 22, 1953. Changed from OFFICIAL USE ONLY June 20, 1956. 18p. Contract AT(10-1)-205. $3.30 (ph OTS); $2.40(mf OTS).

The thermal neutron flux was determined in eight slots of a graphite column with a Ra–Be neutron source in the base. The column was standardized by fitting measured indium

resonance activities to an empirical equation, finding q_{th}, and calculating the thermal flux from the solution of the steady-state thermal diffusion equation for a point source of neutrons in a square column of infinite height. The average value of $nv/A_{th} = 0.134$ for counter No. 1. (auth)

2692 IDO-16196
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
FEASIBILITY OF A LOW-TEMPERATURE IRRADIATION FACILITY AT THE MTR LIQUID-NITROGEN REQUIREMENTS. G. H. Hanson and E. Fast. Nov. 8, 1954. Changed from OFFICIAL USE ONLY June 20, 1956. 21p. Contract AT(10-1)-205. $4.80(ph OTS); $2.70(mf OTS).

Because of the interest expressed by experimenters in a low-temperature irradiation facility at the MTR, a feasibility study has been made to determine the liquid-nitrogen requirements. Initial cost would include design and construction of the facility only because a liquid-nitrogen production plant of sufficient capacity is already available at ICPP. Operating costs would be moderate. The results summarized show that a low temperature irradiation facility at the MTR is feasible from the consideration of liquid-nitrogen requirements. (auth)

2693 IDO-16266
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
COMPUTATION PROCEDURES FOR A TWO-GROUP THREE-REGION CYLINDRICAL APPROXIMATION. A. V. Grimaud. June 22, 1954. 17p. Contract AT(10-1)-205. (MTRL-54-52). $3.30(ph OTS); $2.40(mf OTS).

The design calculations for the Reactivity Measuring Facility (RMF) required the repeated solution of two-group three-region diffusion theory equations for a cylindrical approximation. The procedures and the computational forms used in the calculations are presented. (auth)

2694 IDO-16267
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
HYDRAULIC TESTS IN THE MTR LATTICE. Supplementary Report. T. R. Wilson, Jr. and O. J. Elgert. Feb. 10, 1955. 16p. Contract AT(10-1)-205. (PPC-47). $3.30(ph OTS); $2.40(mf OTS).

Additional hydraulic tests have been conducted in the MTR lattice, and several changes have been made in the end box design in an attempt to balance pressures. The fuel elements with 0.065 inch outside fuel plates and $^3/_{16}$ inch side plates now on order should withstand the differential pressures which presently exist. (auth)

2695 KAPL-98
Knolls Atomic Power Lab., Schenectady, N. Y.
NOTE ON THE THEORY OF DANGER COEFFICIENTS. Henry Hurwitz, Jr. Sept. 18, 1948. Decl. Sept. 19, 1956. 17p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

A formalism is developed for providing a physical understanding of the effects which occur in danger coefficient measurements in intermediate energy assemblies. The changes in reactivity due to changes made in an assembly are described in terms of a function F(r,E) which is called the iterated fission probability. This function represents the number of fissions which are caused after a large number of generations by a neutron of energy E introduced into the assembly at point r. It is proportional to the adjoint function in the usual perturbation theory but the theory of adjoint functions is not used in the presentation. The application of the formalism to certain experiments is discussed. (auth)

2696 KAPL-1235
Knolls Atomic Power Lab., Schenectady, N. Y.
AN ELECTRONIC TRIP SYSTEM FOR REACTOR PROTECTION—MODEL B. R. S. Stone and E. J. Wade. Oct. 25, 1954. Changed from OFFICIAL USE ONLY June 26, 1956. 27p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

This report is a description of a reactor protective system which was installed on two of the critical assemblies at the Knolls Atomic Power Laboratory. The increased reactor protection inherent in this system over that in simpler systems more than justifies its use. Careful design and the inclusion in the circuit of servicing aids have minimized reactor shutdown time because of equipment failure. (auth)

2697 KAPL-M-DD-1
Knolls Atomic Power Lab., Schenectady, N. Y.
HEAT TRANSFER IN MTR IRRADIATION CAPSULES. Herbert E. Barrie. Sept. 20, 1955. Changed from OFFICIAL USE ONLY Oct. 18, 1956. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

2698 KAPL-M-ELW-1
[Knolls Atomic Power Lab., Schenectady, N. Y.]
TWO DIMENSIONAL MULTIGROUP EQUATIONS r, Θ DEPENDENCY 5-POINT DIFFUSION EQUATION. E. L. Wachspress. July 13, 1953. 22p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

In order to determine the neutron flux which will satisfy the boundary conditions and the diffusion equation throughout a reactor, the diffusion equation was expressed in difference form. The difference form to be used at a point in a continuous region, and the difference form to be used at a boundary between two or more media were derived. Boundary conditions, which depend upon a specific problem, were analyzed. By an iterative procedure, the difference equations developed can be used to determine the neutron flux in a reactor where the z dependency has been separated out so that there is only an r, Θ dependency. (auth)

2699 KAPL-M-ELW-2
Knolls Atomic Power Lab., Schenectady, N. Y.
ITERATION PROCEDURE FOR TWO DIMENSIONAL MULTIGROUP PROBLEMS r-θ DEPENDENCY. E. L. Wachspress. Dec. 18, 1953. Decl. Feb. 9, 1956. 28p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

2700 KAPL-M-IB-11
Knolls Atomic Power Lab., Schenectady, N. Y.
RELATIONSHIPS BETWEEN POWER TRANSFERRED TO COOLANTS FROM CYLINDRICAL CONTAINERS AND ρC_p, VOLUME FRACTION, AND VΔT OF THE COOLANTS. I. Bornstein and L. A. Berger. June 9, 1953. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Nomographs and graphs are given which relate the power removed from cylindrical containers with the properties of various coolants such as Na, Li, NaOH, and H_2O. (B.J.H.)

2701 KAPL-M-IMC-1
Knolls Atomic Power Lab., Schenectady, N. Y.
TRANSIENT AND STEADY-STATE TEMPERATURES IN A LIQUID METAL COOLING SYSTEM. Ingard M. Clausen, Jr. Dec. 17, 1952. 36p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

A method for the numerical solution of transient and steady-state temperatures in a liquid metal cooling system are developed. The cooling system around which the formulation is built is fairly complex; including forced convection and free convection multi-channeled coolant loops, and internal heat generation. The finite difference equa-

tions derived allow for heat transfer by conduction and convection, and permit extreme variation in channel flow rate. (auth)

2702 KAPL-M-JRS-7
Knolls Atomic Power Lab., Schenectady, N. Y.
NOTE ON REACTOR POWER GENERATION AFTER SHUTDOWN. John R. Stehn. Apr. 13, 1954. 4p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The bases for estimating the power generation rate of a reactor which has been shut down for some time are outlined as an aid in SIR cooling system design. Results of calculations are given in graphical form. (B.J.H.)

2703 KAPL-M-JZ-3
Knolls Atomic Power Lab., Schenectady, N. Y.
STRESS ANALYSIS OF CONCENTRIC PLUG, MARK A. J. Zickel. Mar. 5, 1954. 14p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The upper half of the concentric rotating plug is a pressure vessel of complicated design. It also acts as part of the cover for the container which holds the power unit. Despite its name the plug is eccentric, and therefore, an exact analysis is almost impossible. An approximation can be made by analyzing an axisymmetric structure with dimensions of the narrowest, widest, and average section. The actual stress at these sections will not differ appreciably from the calculated values. Rotations and deflections, however, will not correspond too well because the torsion effect of the flange is neglected. (auth)

2704 KAPL-M-RE-107A
Knolls Atomic Power Lab., Schenectady, N. Y.
PRELIMINARY OBSERVATIONS OF CONTROL HOUSING NATURAL CONVECTION FLOW. C. G. Lindquist. Dec. 10, 1955. 5p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Observations of the flow paths and velocities in annuli simulating the conceptual design of the control rod drive mechanism were carried out. Lower and upper water reservoirs were connected by a Plexiglass cylinder 5½ inches long with a centered core rod or lead screw extending through the cylinder. The core pieces used were a Plexiglass lead screw with .040 inch clearance, an Al rod with .040 inch clearance, and a plastic rod with .32 inch clearance. Dye injection was used to measure velocities which were of the order of .05 to .2 ft per sec. With small clearance (.040 inch) one upward and one downward flow path were observed, and with the larger clearance (.32 inch) several flow paths were observed. The order of magnitude of the rate of heat circulation was 500 B.t.u. per hr transported by either the upward or downward flow path. (auth)

2705 KAPL-M-RLM-3
Knolls Atomic Power Lab., Schenectady, N. Y.
INVESTIGATION OF CRACKING OF SIR MARK A ROTATING PLUG SHIELD CAN WELDS. R. L. Mehan. July 2, 1954. 11p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A metallurgical investigation was performed to determine the cause of cracking of rotating plug shield can welds. It was concluded that the cause was due to an undesirable microstructure resulting from a welding procedure which produced a fully austenitic weld. To correct the situation, filler material should be added to produce a weld containing 5–10% ferrite. Future inspection of such welds should utilize the red dye penetrant test rather than visual examination. (auth)

2706 KAPL-M-SMS-6
Knolls Atomic Power Lab., Schenectady, N. Y.
SAR RADIOACTIVE ACCESSIBILITY INVESTIGATIVE PROGRAM. V. L. Galezunas. Sept. 29, 1955. 23p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Due to proposed use of a carbon steel–water system in SAR, a program directed at solving the new accessibility program is outlined. Properties of the crud, rate of accumulation of radioactive material in components external to the reactor, effect of radioactive crud level in primary coolant water, effect of heat and radiation flux on deposition and release of radioactive crud, and removal of radioactive products from primary coolant water are the 5 main areas of investigation. (T.R.H.)

2707 LWS-24733
California Research and Development Co., Livermore.
HEAT TRANSFER CONSIDERATIONS IN A MOLTEN FUEL REACTOR CORE. B. W. Ela. Jan. 14, 1953. Decl. Apr. 19, 1956. 9p. (CRD-R-28). $1.80(ph OTS); $1.80(mf OTS).

Heat transfer in a pool of molten fuel containing a bank of submerged cooling tubes is considered. The case is reduced to one of a cylindrical cell in which the fuel forms the walls of the cooling tube. This simplification permits a reasonable estimation of heat transfer using conduction formulas only. (D.E.B.)

2708 LWS-24806
California Research and Development Co., Livermore, Calif.
POWER REACTOR LOGISTICS II. D. B. Willmer. Apr. 21, 1953. Decl. Apr. 3, 1956. 10p. (CRD-R-51). $1.80 (ph OTS); $1.80(mf OTS).

A consideration is made of the amount of U^{235} required if either individual power reactors were started up on this material or separate power-producing converters were built in the initial stages of the nuclear power industry and were operated until sufficient Pu or U^{233} were available for the breeding cycle. (B.J.H.)

2709 LWS-29066
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
HAZARDS ATTENDANT TO OPERATION OF WATER BOILER NEUTRON SOURCE WITH EXPONENTIAL STUDIES. May 22, 1953. Changed from OFFICIAL USE ONLY Sept. 27, 1956. 120p. Contract AT(11-1)-74. $18.30(ph OTS); $6.00(mf OTS).

The radiological hazards attendant to the operation of a low power thermal reactor and associated exponential studies at the Livermore Research Laboratory are evaluated. The calculations indicate no intolerable emergency radiation exposures would occur outside the controlled area of the site from either routine operation or catastrophes. Included are reports on the geology, meteorology, and seismicity of the valley. (auth)

2710 M-3998
[Clinton Labs., Oak Ridge, Tenn.]
PILE TECHNOLOGY. Lectures 12 and 13. F. L. Friedman. [nd]. Decl. Dec. 5, 1955. 32p. Charge $6.30(ph OTS); $3.00(mf OTS).

Problems to be considered in the design of reactor shields are discussed. (C.H.)

2711 M-4412(Pts. I-III)
Ferguson (H. K.) Co., New York.
BROOKHAVEN NATIONAL LABORATORY DESIGN MANUAL. BOOK NO. 1. VOLUME 3. PARTS I–III. PILE. Apr. 1949. Decl. Feb. 15, 1956. 330p. (HKF-8(Pts. I-III)). $55.00(ph OTS); $11.10(mf OTS).

The nuclear facilities at BNL are described. Fundamental considerations influencing the design are reviewed. The fundamental design data set up for each unit, the basic data

and assumptions used in carrying out the design, and a record of the completed design are presented. Drawings and photographs are included. (C.H.)

2712 M-4414

Ferguson (H. K.) Co., New York.

BROOKHAVEN NATIONAL LABORATORY PILE OPERATING MANUAL. Book No. 2. Apr. 1949. Decl. Jan. 13, 1956. 161p. [For] Brookhaven National Lab. Contract [AT-30-2-gen-16]. $27.30(ph OTS); $8.10(mf OTS).

Included are operating procedures for the BNL Reactor console, fan house, cooling tower, He system, reactor loading and unloading, experimental facilities, and the filters and stack. (B.J.H.)

2713 M-4416

Massachusetts Inst. of Tech., Cambridge. Servomechanisms Lab. and Jackson and Moreland (Engineers), New York.

MANUAL OF INSTRUMENTS AND CONTROLS FOR THE BROOKHAVEN NUCLEAR REACTOR. BOOK 3, VOL. II. May 1949. Decl. Jan. 11, 1956. 225p. $34.80(ph OTS); $9.90(mf OTS).

This book is one of a series written for Brookhaven National Lab., prepared under contract to H. K. Ferguson Co.

Reactor activity instrument systems designed for the Brookhaven Reactor are described. The instruments indicate reactor conditions and serve to guide the operator, actuate the alarm and emergency-shutdown systems, and record reactor-activity data. Designations and functions of the various systems are described. Photographs and circuit diagrams of the various instruments and components are included. (C.H.)

2714 M-4512

Babcock and Wilcox Co., New York.

ANALYSIS AND RECOMMENDED MODIFICATIONS FOR SHIELD STRUCTURE — BROOKHAVEN NATIONAL LABORATORY FOR THE H. K. FERGUSON CO., INC. R. G. Lloyd and E. A. Brooks. July 24, 1950. Decl. Dec. 8, 1955. 206p. Subcontract PRO-111(S-26-146), Supplement No. 1. $31.80(ph OTS); $9.30(mf OTS).

This report cancels and supersedes all previous information released by the Babcock and Wilcox Co. relative to the shield structure, either verbal or written.

An analysis was made of the shield structure at the Brookhaven Reactor and recommendations are presented for reinforcing and altering the design to raise the strength level and increase the service life of the structure. Drawings and supporting calculations for the recommendations are included. (C.H.)

2715 M-4575

Babcock and Wilcox Co., New York.

ANALYSIS AND RECOMMENDED MODIFICATIONS FOR PILE STRUCTURE AT THE BROOKHAVEN NATIONAL LABORATORY. June 15, 1950. 554p. For H. K. Ferguson Co. Contract AT-30-2-GEN-16. Subcontracts S-26 and PRO-111-(S-26-146). $96.30(ph OTS); $11.10 (mf OTS).

Recommendations are presented for altering the design of the Brookhaven Reactor to raise the strength level and increase the service life of the pile structure. Drawings and supporting calculations for the recommendations are included. (C.H.)

2716 M-4589

Brookhaven National Lab., Upton, N. Y.

BASIC THEORY FOR THE SIGMA PILE. F. L. Friedman. Sept. 26, 1947. Decl. Jan. 13, 1956. 3p. $1.80(ph OTS); $1.80(mf OTS).

Equations are developed for describing neutron slowing down in the graphite testing columns in Sigma Pile. (D.E.B.)

2717 M-4596

Babcock and Wilcox Co., New York.

ANALYSIS AND RECOMMENDED MODIFICATIONS FOR DUCTS AND PLENUM CHAMBERS AT BROOKHAVEN NATIONAL LABORATORY. Morton Boone and E. E. Schoessow. Jan. 24, 1950. Decl. Feb. 2, 1956. 163p. For the H. K. Ferguson Co. Contract AT-30-2-gen-16, Subcontracts S-26 and PRO-111(S26-146). $30.30(ph OTS); $8.70(mf OTS).

Recommendations are presented for reinforcing and altering the design of air ducts and plenum chambers of the Brookhaven Reactor. It was concluded that these changes would raise the strength level and increase the service life of the structure. Drawings and supporting calculations for the recommendations are included. (C.H.)

2718 MonN-188(Bks. I and II)

Clinton Labs., Oak Ridge, Tenn.

PRELIMINARY DESIGN PROPOSAL — DANIELS EXPERIMENTAL POWER PILE. C. Rogers McCullough. Nov. 1, 1946. Decl. Jan. 10, 1956. 178p. Contract W-35-058-eng-71. $33.30(ph OTS); $9.60(mf OTS).

The reactor will be a high temperature power unit designed and built especially to study experimentally the engineering features of a nuclear power plant. The pile will be run initially at 4000 KW of heat and will be designed to operate at power levels up to a maximum of 40,000 KW of heat if operating experience proves this possible. Helium gas as a coolant, will flow through the annular spaces between fuel rods and moderator bricks, and will be distributed by orifices among channels according to heat production. It will be circulated through the pile and through two external steamboilers which have a total steam capacity of 110,000 lb/hr. by 4 blowers requiring 150 KW driving power each. For the maximum anticipated heat output the pressure of the He will be 10 atmospheres and the maximum mass flow rate 34 lb/sec. Equipment will be in duplicate so that the system may be run at half power in case of partial failure. Coolant will enter the reactor at 500°F and leave at 1400°F. The highest temperature within the reactor will be 1750°F and the average reactor temperature will be 1200°F (650°C). (auth)

2719 NAA-SR-103

North American Aviation, Inc., Downey, Calif.

THE NAA EXPONENTIAL ASSEMBLY. PART I. APPARATUS AND PRELIMINARY PROCEDURE. A. T. Biehl and E. R. Cohen. June 22, 1951. Decl. Apr. 10, 1956. 44p. Contract AT-11-1-gen-8. $0.30(OTS).

The NAA exponential assembly was constructed to supply information to aid in the design of neutron production reactors. This assembly consists of a graphite pedestal containing Po–Be neutron sources, an Al tank 5 feet in diameter and 6 feet high for containing a D_2O-natural U lattice, a storage tank and pumping system for the D_2O, and an assortment of fuel tubes. A theoretical analysis is presented of the harmonics to be expected in the neutron flux due to the location of the neutron sources, and a comparison is made with experimental measurements. As part of the preliminary procedure, the diffusion length of thermal neutrons in D_2O of available purity was measured to be 109 ± 5 cm. (auth)

2720 NAA-SR-Memo-51

North American Aviation, Inc., Downey, Calif.

NEUTRON FLUX DISTRIBUTIONS IN A LATTICE CELL. PART II. E. R. Cohen. Aug. 1, 1951. Decl. Aug. 27, 1956. 3p. $1.80(ph OTS); $1.80(mf OTS).

Corrected equations for neutron flux distribution in lattice cells are given. (F.S.)

2721 NAA-SR-Memo-78
North American Aviation, Inc., [Downey, Calif.]
A^{41} ACTIVITY FROM LPR WARM-UP. E. Richard Cohen. Aug. 15, 1951. Decl. Apr. 11, 1956. 5p. $1.80(ph OTS); $1.80(mf OTS).

The A^{40} in the air gap between reflector and shield of LPR becomes A^{41} by neutron capture, and expansion of the gas due to warmup expels the A^{41} to room air. The calculations of A^{41} activity on warmup and on pile operation at constant temperature are given. (T.R.H.)

2722 NAA-SR-Memo-408(Del.)
[North American Aviation, Inc., Downey, Calif.]
A STUDY OF THE HAZARDS ASSOCIATED WITH THE NORTH AMERICAN AVIATION WATER BOILER NEUTRON SOURCE. M. E. Remley. Aug. 1, 1952. Decl. with deletions Dec. 5, 1955. 50p. $9.30(ph OTS); $3.60(mf OTS).

A description of a low power water boiler type reactor in operation at the Atomic Energy Research Department of North American Aviation, Inc. is presented. A study of the potential hazards associated with the operation of this reactor in its present location has been made. In particular, the information necessary to permit a safety evaluation of the reactor installation is reported. It is concluded that the operation of the reactor at a power level of 1 watt constitutes no significant hazard to the personnel directly connected with the experimental program in which the reactor is used, to the production of the adjacent laboratories in the North American Aviation organization, or to the population residing in the surrounding area. (auth)

2723 NAA-SR-Memo-631
North American Aviation, Inc., Downey, Calif.
THERMAL FLUX AVAILABILITY IN UCLA MEDICAL REACTOR. E. R. Cohen. Mar. 13, 1953. 8p. $1.80(ph); $1.80(mf).

2724 ORNL-1368(Del.)
Oak Ridge National Lab., Tenn.
SOME EFFECTS OF TRANSMUTATION PRODUCTS ON U^{233} BREEDER PILE OPERATION. J. Halperin and R. W. Stoughton. Sept. 29, 1952. Decl. with deletions Feb. 23, 1956. 38p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

Mathematical treatment is given the problem of fuel losses due to chemical processing plus neutron losses to fission products in a U^{233} breeder reactor. The influence of various parameters on the losses and on the optimum processing period is investigated. (T.R.H.)

2725 ORNL-1567(Del.)
Oak Ridge National Lab., Tenn.
HEAVY ISOTOPE BUILD-UP IN CORE OF U^{233} BREEDER. J. Halperin and R. W. Stoughton. Oct. 6, 1953. Decl. with deletions Feb. 1, 1956. 24p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

The build-up of U isotopes with time in a U^{233} breeder core was calculated for five different cases, the difference depending on the starting fuel and the isotopic composition of the continuously added make-up fuel. The total U concentration was found to approach slowly an equilibrium value of 2.6 to 3.5 times the starting value, depending on the composition of the make-up fuel. In all cases the net neutron losses per net neutron reproduced in the core go through a maximum of less than 1% at a flux-time of about 3×10^{21}, go through a minimum of about -0.6% (i.e., a net gain) at about a flux-time of 4×10^{22}, and approach equilibrium values of about 0.3% at flux-times above 6×10^{23}. (auth)

2726 TID-5065
Oak Ridge National Lab., Tenn.
PRELIMINARY BOILING EXPERIMENT IN THE LITR. W. M. Breazeale, T. E. Cole, J. A. Cox. 1953. Decl. Feb. 17, 1955. 7p. Contract W-7405-eng-26. (CF-53-5-69). $1.80(ph OTS); $1.80(mf OTS).

An experiment which involved boiling the water in the active lattice of the LITR with the circulation pump shut off was performed to determine the power level at which boiling would first take place and to observe the flux variation with time while boiling. (F.S.)

2727 TID-5272
American Machine and Foundry Co. General Engineering Lab., Greenwich, Conn.
ORNL CONTROL ROD DRIVE MECHANISM. Final Test Report. H. Bolwell. Aug. 1954. Decl. Jan. 16, 1956. 60p. For Oak Ridge National Lab. Contract [W-7405-eng-26]. $16.80(ph OTS); $5.70(mf OTS).

The feasibility of a control rod drive mechanism was determined for packaged pressurized water reactor. Detailed component recommendations were made. (F.S.)

2728 WAPD-13
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
SOLUTIONS OF THE PILE KINETIC EQUATIONS WHEN THE REACTIVITY IS A LINEAR FUNCTION OF THE TIME. Sylvan Wallach. Nov. 30, 1950. Changed from OFFICIAL USE ONLY July 18, 1956. 31p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.80(mf OTS).

The pile kinetic equations for the thermal-neutron density are solved when the reactivity is a linear function of the time. Two methods of solution are outlined. The first is applicable only in the case of one group of delayed neutrons, and then only for certain linear functions of the time. The second method can be used in all cases. The results indicate that sufficient accuracy may be obtained by considering just one group of delayed neutrons with suitable properties. This fact is illustrated by means of a graph comparing solutions using one group and six groups of delayed neutrons. (auth)

2729 WAPD-EM-15
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TRANSIENT OPERATION OF A THERMAL CONVECTION SYSTEM. J. E. Zerbe. Aug. 22, 1950. Changed from OFFICIAL USE ONLY July 18, 1956. 11p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

Approximate calculations have been made to determine the effect of transient operation of a thermal convection cooling system. Assuming that the system starts with zero velocity with the full design heat load being introduced in the hot leg of the system, calculations show that no hot spots will exist during the transient (while the system is coming up to equilibrium flow and velocity). In other words, the flow at any instant will be in approximate equilibrium with the density distribution in the convection loop at that instant. A check test was made on a thermal convection system employing two loops in series. Temperatures were recorded as a function of time. These data have shown that no hot spots occurred during the transient condition for the system tested. (auth)

2730 WAPD-ReM-10
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
AN ANALYSIS OF THE GEOMETRY OF THE BALL NUT AND SCREW. John T. Hunt. Nov. 3, 1952. Changed from

OFFICIAL USE ONLY Oct. 3, 1956. 14p. $3.30(ph OTS); $2.40(mf OTS).

The stable operating position of the parts of a ball nut and screw is described. (J.H.M.)

2731 WAPD-RM-54
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TRANSIENT MEASUREMENTS OF COOLANT PUMP CHARACTERISTICS. Joseph P. Franz. July 17, 1951. Changed from OFFICIAL USE ONLY Sept. 12, 1956. 17p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The initial phase of an experimental and analytical program to determine the transient performance of the reactor coolant system is presented. The results of tests made on the Westinghouse Large Model Test Pump for step changes of frequency from 0, 15, 30, and 45 cps to 60 cps are reported, and data for 15 cps start-up and coast-stop are included. The coolant flow response of the LMT Pump to an increasing step change in frequency is shown to consist of a variable delay which decreases with increasing frequency, followed by a linear rise in flow on the order of 3000 gpm per sec. (auth)

2732 WAPD-RM-167
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
HANDBOOK OF FORMULAS FOR TWO GROUP CRITICALITY CALCULATIONS IN HOMOGENEOUS REACTORS. H. L. Garabedian. Feb. 1953. Changed from OFFICIAL USE ONLY July 18, 1956. 61p. Contract AT-11-1-GEN-14. $9.30(ph OTS); $3.60(mf OTS).

2733 WAPD-RM-198
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
A PROPOSED METHOD FOR TESTING REACTOR PERIOD SAFETY CIRCUITS. F. J. Jankowski. Sept. 1953. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 12p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40 (mf OTS).

A constant-speed straight line source motion is proposed as a means of testing reactor period safety circuits. Both motion along a line intercepting the detector and motion along a line by-passing the detector are investigated. These source motions result in periods which vary slowly enough to give an accurate check on the safety circuit operation and which are typical of the conditions in which the circuits would be required to operate. The results of this type of test are easily interpreted. (auth)

2734 WAPD-TH-118
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh].
PRESSURE DROP THROUGH PARALLEL ROD SUBASSEMBLIES HAVING A 1.12 EQUILATERAL TRIANGULAR PITCH. B. W. LeTourneau and R. E. Grimble. Aug. 29, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 10p. $1.80(ph OTS); $1.80(mf OTS).

One possible type of reactor fuel element in which the flow is parallel to the element consists of bundles of rods arranged on a triangular pitch and held together at the ends by tube sheets or some other suitable connection. Friction factors, entrance plus exit loss coefficients, and joint loss coefficients have been determined for parallel flow rod subassemblies having 0.500 in. rods on a 0.560 in. equilateral triangular pitch (1.12 dimensionless pitch). The results are presented in graphical form in this report. Both tube sheet and partial egg crate end connection designs were studied. (auth)

2735 WAPD-TH-132
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
ESTIMATED FILM BOILING HEAT TRANSFER COEFFICIENTS AT BURNOUT. S. J. Green. Sept. 12, 1955. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 11p. $3.30(ph OTS); $2.40(ph OTS).

The results of heat flux calculations indicate the fuel element temperature excursion during film boiling is not as great as is predicted by adiabatic heat transfer calculations. The equations used in the calculations are given and their use is discussed. (D.E.B.)

2736 WAPD-TH-153
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ADDITIONAL PRESSURE DROP TESTS ON PARALLEL FLOW ROD SUBASSEMBLIES WITH TUBE SHEETS. B. W. LeTourneau and R. E. Grimble. Nov. 9, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

Refer also to abstracts 2430 and 2445.

NUCLEAR TRANSFORMATION

2737 CF-53-12-26
Oak Ridge National Lab., Tenn.
THE Li^7 (n,t) REACTION. R. L. Macklin and H. E. Banta. Dec. 9, 1953. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The Li^7(n,t) reaction has been detected by measuring the H^3 produced upon neutron activation of Li^7. A cross section of 85 ± 20 mb was found for fission neutrons above 2.8 Mev and 30 ± 20 mb for Po–Be neutrons. (auth)

2738 HW-33414
Hanford Atomic Products Operation, Richland, Wash.
COMPUTED FISSION PRODUCT DECAY. J. W. Healy, G. E. Pilcher, and C. E. Thompson. Dec. 1, 1954. 102p. Contract [W-31-109-Eng-52]. $16.80(ph OTS); $5.70(mf OTS).

Results of calculations for the amounts of fission products from U^{235} only after 10 different irradiation times from 1 hour to 500 days and for 15 decay times from 0 to 3000 days are presented. Comparison of the total with the Way-Wigner relations indicates reasonable agreement. (auth)

2739 KAPL-M-HB-3
Knolls Atomic Power Lab., Schenectady, N. Y.
MEASUREMENT OF α FOR Pu AT 20 KV. Harvey Brooks. Apr. 11, 1947. Decl. Feb. 7, 1956. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

2740 LA-1399
Los Alamos Scientific Lab., N. Mex.
THE FISSION ENERGY BARRIER. Robert B. Duffield. Oct. 1951. Decl. Dec. 1, 1955. 9p. Contract W-7405-eng-36. $0.15(OTS).

Experimental evidence is presented indicating a somewhat less strong dependence of the fission energy barrier of the nucleus on the atomic number and atomic mass number than that predicted by the liquid drop theory of nuclear phenomena. The experimental data do not appear to show the large variation in the fission energy barrier predicted by the liquid drop model. (L.T.W.)

2741 UCRL-1195(Rev.)
California. Univ., Berkeley. Radiation Lab.
HIGH ENERGY PROTON SPALLATION—FISSION OF URANIUM. R. L. Folger, P. C. Stevenson, and G. T. Seaborg. May 28, 1951. Changed from OFFICIAL USE

ONLY June 26, 1956. 71p. Contract W-7405-eng-48. $10.80(ph OTS); $3.90(mf OTS).

The fission and spallation reactions caused in U by bombardment with high-energy protons (340 to 350 Mev) were investigated. The reaction products were separated from the target by chemical processes and identified by their radioactive properties. The relative yields of the observed fission products were measured, and the results plotted as a function of mass number. Several of the spallation products were identified and their yields estimated. An attempt was made to determine the most probable atomic number for a nuclide of given mass formed directly from fission. Studies were made of the relative yields along several isobaric chains as a function of atomic number. From these data predictions of the mass and charge of the fissioning nucleus are made. Using the reaction $Al^{27}(p,3pn)Na^{24}$ of known cross section to monitor the bombarding beam, the formation cross sections for several fission product nuclides were measured. Values for these reference nuclides were used to transform the relative yields into formation cross sections. Integration over the range of mass numbers of the area under the curve of formation cross section as a function of mass number led to a value for the total fission cross section for uranium bombarded with high energy protons, assuming predominantly binary fission. (auth)

2742 UCRL-2067

California. Univ., Berkeley. Radiation Lab.

THE CHARACTERISTICS OF BISMUTH FISSION INDUCED BY 340 MEV PROTONS (thesis). William Frederick Biller. Jan. 1953. Changed from OFFICIAL USE ONLY June 26, 1956. 85p. Contract W-7405-eng-48. $13.80 (ph OTS); $4.80(mf OTS).

Bismuth metal was irradiated with 340-Mev protons in the circulating beam of the 184-inch Berkeley cyclotron. Nuclides formed as fission products during the course of the bombardment were separated and studied through the use of radiochemical techniques. The formation cross sections of these nuclides were measured by comparing their yields with that of Na^{24} from the $Al^{27}(p,3pn)Na^{24}$ reaction whose cross section is known. It was observed that fission was predominantly symmetric with the peak yield occurring in the region of the nuclide Nb^{95}. Since the mass of this nuclide is less than half that of the target nucleus, it was concluded that prior evaporation of nucleons preceded the fissioning event. A much greater variety of primary fission products was observed than was in the case of Bi irradiated with 190-Mev deuterons. Over almost the entire range of fission products both positron and negatron emitters were observed. A set of contour curves was fitted to the data from which it was possible to estimate the cross sections for nuclides which could not be determined directly. From the shape of these curves and the absence of symmetry it was concluded that several nuclides were undergoing fission. The total cross section for fission was estimated to be 239 mb. (auth)

PARTICLE ACCELERATORS

2743 CF-55-4-71

Oak Ridge National Lab., Tenn.

AN AUTOMATIC CYCLOTRON-TUNING SYSTEM. N. F. Ziegler. [Apr. 1955]. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An automatic tuning control has been constructed and tested with a small oscillator. The control should prove applicable to the tuning of a variable-frequency cyclotron; other systems are to be tested and compared with the one discussed. The operation of the tuning control involves sweeping the oscillator through its entire range and storing the peak voltage developed across a tuned secondary on a capacitor. During a second sweep of the oscillator frequency the voltage across the tuned secondary is compared with that stored on the capacitor. When the two voltages are equal, the control terminates the sweep and leaves the oscillator tuned to the resonant frequency of the secondary. The tuning control operated very reliably during tests and was quite accurate in tuning the oscillator to which it was applied. (auth)

2744 UCRL-1222

California. Univ., Berkeley. Radiation Lab.

ARC CATHODE DEVELOPMENT. Harry G. Heard. Apr. 19, 1951. Decl. Sept. 21, 1956. 37p. Contract W-7405-eng-48. $0.40(OTS).

Investigation has shown that cathodes of the Phillips' design geometry do not give satisfactory performance as hot-cathode arc sources. A design of diffusion emitter has been developed which will give emission currents of the order of 1200 amp and emission densities of the order of 200 amp per cm^2 on pulsed and d-c with long life. Sintered thoria cathodes have been evolved in a geometry which shows promise of eliminating back bombardment problems in a high power ion source. Low-temperature sintered BaO–W compressed cathodes and carbon cathodes are treated. (auth)

2745 UCRL-2229

California. Univ., Berkeley. Radiation Lab.

FULL SCALE 48 MC CAVITY FOR SPARKING TESTS OF GAPS CORRESPONDING TO 0.45 to 4.5 MEV BEAM ENERGY. Craig S. Nunam. May 19, 1953. Decl. June 11, 1956. 10p. Contract [W-7405-eng-48]. $3.30(ph) OTS); $2.40(mf OTS).

2746 Y-B22-24

[Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.]

MATHEMATICAL DISCUSSION OF COLLECTION IN CYCLORATOR CONSIDERING A GENERAL ANGLE OF INCIDENCE FOR IONS. Mozelle Rankin and Raymond Murray. Feb. 14, 1949. Decl. Feb. 8, 1956. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

2747 Y-B22-25

[Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.]

VELOCITY AND ENERGY MODULATION BY R.F. ON G SLITS. Raymond Murray. Feb. 16, 1949. Decl. Feb. 8, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

To obviate problems connected with applying RF to the cyclerator source or liner, it was proposed to provide energy modulation of ions by RF on half of a split G slit. An exact solution of the ion motion problem is difficult to obtain, but two limiting cases designated "drift tube" and "anti–drift tube" were considered. (F.S.)

RADIATION ABSORPTION AND SCATTERING

2748 CF-53-2-50

[Oak Ridge National Lab., Tenn.]

THE ATTENUATION OF CAPTURE GAMMAS IN A PLANE LIMITED MEDIUM OF FINITE THICKNESS. F. H. Abernathy and H. L. F. Enlund. Feb. 6, 1953. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

2749 CF-54-8-103

Oak Ridge National Lab. Tenn.

GROUND SCATTERING OF NEUTRONS FROM A CYLINDRICALLY SYMMETRIC SOURCE. H. E. Stern and A.

Simon. Aug. 8, 1954. Contract [W-7405-eng-26]. $1.80 (ph); $1.80(mf).

A convenient expression has been derived for the ground scattering resulting from a source which emits neutrons in a cylindrically symmetric angular distribution. Both the source-receiver axis and the axis of symmetry of the source distribution are assumed to be parallel to the ground plane and to be at an angle θ to each other. The receiver is assumed to be nondirectional, air attenuation is neglected, and a constant ground reflection coefficient (or albedo) is assumed. (auth)

2750 CF-54-9-133
Oak Ridge National Lab., Tenn.
ATTENUATION OF BETA ENERGY ALONG A STRAIGHT LINE PATH THROUGH VARIOUS ABSORBING MEDIA. T. W. Leland. Sept. 17, 1954. Changed from OFFICIAL USE ONLY Dec. 7, 1956. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

2751 KAPL-317
Knolls Atomic Power Lab., Schenectady, N. Y.
COMPTON SCATTERING OF GAMMA RAYS FROM A THICK SLAB AT SKEW ANGLES. L. Tonks and L. H. Root. Mar. 20, 1950. Changed from OFFICIAL USE ONLY June 26, 1956. 19p. Contract [W-31-109-eng-52]. Charge $3.30(ph OTS); $2.40(mf OTS).

Photon scattering from a plane surface of a thick scatterer is calculated for the general case in which the scattering plane may make any azimuthal angle from 0 to 180° with the plane of incidence. Complete results are given in graphical form. (B.J.H.)

2752 WAPD-RM-219
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THE DIFFUSION OF COLLIMATED GAMMA RAYS IN WATER. Felix W. Marasco and Paul E. F. Thurlow. Jan. 1954. Changed from OFFICIAL USE ONLY Oct. 1, 1956. 28p. $4.80(ph OTS); $2.70(mf OTS).

The dosage intensity pattern of a Co^{60} gamma beam was measured with an anthracene detector in an effectively infinite water medium. Dosages were measured from zero to sixty degrees from the beam, and at radial distances of from 20 to 50 cm from the point of entrance of the beam into the water. Results indicate an exponential radial dosage attenuation at large distances from the source. Dosages measured in the beam followed a predicted $e^{-\mu r}/r^2$ uncollided photon curve. (auth)

2753 WAPD-TN-508
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
FLUXES FROM REGULAR GEOMETRIC SOURCES. A. Foderaro and F. Obenshain. June 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 107p. $16.80 (ph OTS); $5.70(mf OTS).

A corrected set of equations for the fluxes from geometric sources is presented. Derivations of the equations and the curves and data necessary for hand computation are included. The effects of shields are considered. The geometric sources for which equations are provided are point, line, disc, infinite slab, truncated cone, cylindrical, and spherical sources. The regions in which it is valid to use point source approximations are derived for line, disc, and truncated cone sources. The effect of quanta being scattered one or more times before reaching the detector is discussed. (F.S.)

RADIATION EFFECTS

2754 KAPL-1134(Del.)
Knolls Atomic Power Lab., Schenectady, N. Y.
THE EFFECTS OF GAMMA IRRADIATION AND ELEVATED TEMPERATURE ON THE ELECTRICAL PROPERTIES OF INSULATION. P. H. Klein. Apr. 16, 1954. Decl. with deletions Jan. 5, 1956. 16p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

The stator of an electromagnetic pump was subjected to 5×10^9 r of γ radiation from a 3400 c Co^{60} source. On inspection following the irradiation, no damage to the insulation was perceived. (D.E.B.)

2755 KAPL-M-LFC-5
Knolls Atomic Power Lab., Schenectady, N. Y.
A MODEL FOR RADIATION DAMAGE. L. F. Coffin, Jr. and T. M. Snyder. Nov. 26, 1952. 8p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

The effect on the lattice of additional foreign atoms stemming from fission is considered. A model is developed in which the lattice is considered as spherical in shape with a foreign atom located at the center of each sphere. The size of the sphere is determined by the density of foreign atoms. Stresses and deformations in the foreign atom and lattice are then calculated, assuming an isotropic elastic medium. From this analysis it is shown that the volume increase in the lattice exactly equals the increment of new volume introduced by the foreign atom. Furthermore, the dilatation of the lattice is independent of radius and linear with exposure. A criterion for fracture along cleavage planes for a critical number of foreign atoms also is derived from the model. (auth)

2756 KAPL-M-WWT-1
Knolls Atomic Power Lab., Schenectady, N. Y.
ELECTRON THEORY OF THERMOELECTRIC EFFECTS. W. W. Tyler. Sept. 1951. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 17p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Expressions are derived which permit the rough prediction of changes in calibration of various thermocouples due to neutron damage. Several generalities are proposed regarding these changes. (T.R.H.)

2757 KLX-57
Kellex Corp., New York.
RADIATION MEASUREMENT DEVELOPMENT. Detailed Project Status Report. Job 11. Aug. 19, 1949. Decl. Feb. 13, 1956. 13p. Contract AT-30-1-GEN-169. $3.30(ph OTS); $2.40(mf OTS).

Work on solid dielectric counters capable of radiation measurement and discrimination in nuclear chemical installations is reported. Sulfur was shown to exhibit conductivity when bombarded with α particles. Work with sulfur films, sulfur crystals, and other dielectrics appears to be warranted. Tests with Rochelle salts suggest the use of piezoelectric material for detection of lattice vibrations induced by particle bombardment providing a new means of particle detection. (F.S.)

Refer also to abstract 2493.

RADIOACTIVITY

2758 IDO-16270
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
ACTIVITY AND SHIELDING CALCULATIONS FOR STAINLESS STEEL, NICHROME, AND ZIRCONIUM–TIN ALLOY. L. L. Marsden. Mar. 25, 1955. 17p. Contract AT(10-1)-205. (PPC-75). $3.30(ph OTS); $2.40(mf OTS).

The activation during one cycle at the highest MTR flux of stainless steel, Nichrome and zirconium–tin alloy was found and the thickness of lead shielding required to reduce the radiation, of samples exposed to the highest flux, to tolerance was derived. An outline was devised for

a procedure for calculating activities in cases similar to these. (F.S.)

2759 M-4609
Brookhaven National Lab., Upton, N. Y.
CALIBRATION OF RADIUM BERYLLIUM NEUTRON SOURCES. J. S. Levin and J. W. Weil. Sept. 14, 1949. Decl. May 15, 1956. 8p. $1.80(ph OTS); $1.80(mf OTS).

2760 WAPD-TN-510
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
FLUX FROM HOMOGENEOUS CYLINDERS AND SPHERES CONTAINING UNIFORM SOURCE DISTRIBUTIONS. William J. Pervin. May 1955. Changed from OFFICIAL USE ONLY July 18, 1956. 37p. Contract [AT-11-1-GEN-14]. $6.30(ph OTS); $3.00(mf OTS).

A method is presented for calculating the uncollided particle flux as a function of the distance from a homogeneous sphere of homogeneous cylinder containing a uniform isotropic source distribution, assuming that the attenuation of the particles is exponential both within the cylinder or sphere as well as in the attenuating shells or slabs. A derivation for the infinite cylinder case suitable for hand computation was given by Taylor and Obenshain (WAPD-RM-213). Their results have been extended to other geometries and made suitable for calculations by high-speed automatic computers. (auth)

SHIELDING

2761 BNL-145
Brookhaven National Lab., Upton, N. Y.
THE ATTENUATION CHARACTERISTICS OF BROOKHAVEN CONCRETE. W. W. Pratt, M. Fox, H. J. Kouts, and A. C. Rand. Dec. 17, 1951. Decl. Mar. 19, 1956. 32p. $4.80(ph OTS); $2.70(mf OTS).

A set of measurements was carried out to determine the attenuation characteristics of Brookhaven concrete for neutron and γ-ray radiation. The radiation was detected with brass-walled G-M γ-ray counters, BF_3 neutron counters, a paraffin-lined methane-filled fast neutron counter, Au and In foils, and photographic films. The results obtained using the radiation filtering through the graphite reflector of the pile were compared with the results obtained using the radiation emerging directly from a sheet of natural U exposed to thermal neutrons from the pile. An investigation was made of the effectiveness of a thermal shield consisting of a layer of Fe inserted between the source and the concrete shielding. The attenuation of the component of γ radiation emerging perpendicular to the shield face was compared with the attenuation of the total γ radiation emerging from the shield. (auth)

2762 CF-49-12-75
Oak Ridge National Lab., Tenn.
HIGH DENSITY CONCRETE SHIELDING TEST. T. H. J. Burnett. Dec. 19, 1949. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A test wall of barytes aggregate concrete was examined for homogeneity, voids, or fissures and for approximate radiation transmission relative to standard concrete using Ra and Co^{60} sources with different instruments. The homogeneity was found satisfactory in those sections poured as monoliths, while some evidence of relative segregation appeared present at the site of a 20 hour joint in two slabs. Results of the transmission test indicated no significant departure from a density relationship. An empirical relationship to account for scatter in these tests is expressibly given. (auth)

2763 CF-53-10-141
Oak Ridge National Lab., Tenn.
TEMPERATURE AND STRESS DISTRIBUTION IN A SECTIONAL CYLINDRICAL SHIELD AS TYPIFIED BY THE RESEARCH REACTOR. F. T. Binford. Oct. 19, 1953. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Consideration is given to the temperature distribution and resulting stress distribution which exist when a cylindrical concrete reactor shield is constructed in two concentric sections separated by a relatively thin layer of insulating material. It is shown that excessive stresses will occur only at points of the inner section near the core, and that the remaining portions remain relatively stress-free. The calculations have been made for radial heat flow only, and no consideration has been given to the modifying effect of the presence of metal reinforcement in the concrete, or of metal beam hole liners in the neighborhood of the core. (auth)

2764 HW-32968
[Hanford Atomic Products Operation, Richland, Wash.]
ANALYSIS OF CONTROL DATA FOR HIGH DENSITY CONCRETE PLACED AT 105-K. H. S. Davis. Sept. 7, 1954. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 28p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70 (mf OTS).

High density concrete placed by the "Prepakt" method was used for constructing the biological shields and certain other shielding facilities at 105 KW and 105 KE. Because of the critical nature and extent of this work, numerous control tests were made on heavy aggregates, blended materials, and grouts. Summarized in this report are average values defining certain physical properties and quantities of the heavy aggregates and grouts. These data are then analyzed to evaluate the quality of the high density concrete placed in the shielding structure at 105-K. (auth)

2765 HW-36572
Hanford Atomic Products Operation, Richland, Wash.
USE OF HIGH-DENSITY PREPACKED CONCRETE IN REACTOR CONSTRUCTION. Harold S. Davis. May 5, 1955. Changed from OFFICIAL USE ONLY Nov. 26, 1956. 26p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70 (mf OTS).

The construction techniques and equipment used in processing, prepacking, and grouting heavy aggregates used in the Hanford K reactor biological shield are discussed. (F.S.)

2766 IDO-24003
Blaw-Knox Construction Co. Chemical Plants Div., Idaho Falls, Idaho.
BARYTES AGGREGATE CONCRETE APPLIED TO REACTOR SHIELDING. July 1952. Changed from OFFICIAL USE ONLY Oct. 3, 1956. 220p. Contract AT(10-1)-2. $34.80(ph OTS); $9.90(mf OTS).

This report describes methods used for selection, handling, and processing barite ore, test programs conducted to determine the design of the mix for structural properties and density, and actual field operations of mixing and placing three types of concrete made with barite aggregates. (L.T.W.)

2767 KAPL-448
Knolls Atomic Power Lab., Schenectady, N. Y.
LIQUID SHIELDS CONTAINING RANDOMLY PACKED PELLETS. H. H. Race. Jan. 3, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.10(mf OTS).

The composite shield materials described are designed to provide a combination barrier to stop γ radiation with

metal pellets and to stop neutrons with hydrogenous liquid filling the interstices between the pellets. Using single-sized pellets so as to realize a specific packing factor, a range of ratios between the gamma and neutron stopping materials may be obtained by changing the pellet core size and core-filling material. (F.S.)

2768 WAPD-15(Del.)

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

A SIMPLIFIED THEORY OF NEUTRON ATTENUATION AND ITS APPLICATION TO REACTOR SHIELD DESIGN. R. D. Albert and T. A. Welton. Nov. 30, 1950. Decl. with deletions Dec. 2, 1955. 39p. Contract AT-11-1-GEN-14. $0.30(OTS).

A theory has been developed for the attenuation of neutrons in mixtures of hydrogenous and heavy materials primarily for use in connection with shielding designs. The theory is a simplified one which assumes a neutron is essentially lost after a single collision; an equivalent cross section which includes contributions to scattering by heavy materials is left adjustable in the theory. The procedure outlined involves comparison of the theory with experimental bulk shielding results to determine the adjustable parameter. Excellent agreement—for shielding purposes—has been obtained in this way with experimentally obtained spatial flux distributions for H_2O, Fe, and H_2O, and two Pb and H_2O shields of differing composition. (auth)

URANIUM AND URANIUM COMPOUNDS

2769 ANL-5160

Argonne National Lab., Lemont, Ill.

PREPARATION OF ALPHA URANIUM SINGLE CRYSTALS. PART II. STRAIN-ANNEAL METHOD. Final Report. E. S. Fisher. Aug. 1954. Decl. Dec. 10, 1955. 75p. Contract W-31-109-eng-38. $0.45(OTS).

A large number of attempts were made to prepare single crystals of alpha U by the strain-anneal method. Although aggregates of large grains, up to 12 mm in length, were produced, no success was attained in preparing crystal filling the complete cross section of the cylindrical specimen. As the specimens used were widely different in inhibiting particle concentrations, the maximum grain sizes and the critical strains varied considerably. One lot of high purity material required no strain for growth of large grains, whereas, other lots of specimens required strains ranging from between 0 and 0.5% to 1.2%. The failure to produce single crystals is attributed to the occurrence, in some lots, of strain-relieving mechanisms other than growth of recrystallization nuclei and, in other lots, to inhibition of growth of recrystallization nuclei by high concentrations of dispersed particles. It is suggested that the use of penultimate grain sizes larger than were used, in specimens of high purity material, may permit successful use of the strain-anneal method. (auth)

2770 CF-548

[Chicago. Univ. Metallurgical Lab.]

CRITICAL AMOUNTS OF URANIUM COMPOUNDS. E. Konopinski, N. Metropolis, E. Teller, and L. Woods. Mar. 19, 1943. Decl. Feb. 14, 1956. 12p. (A-673). $3.30(ph OTS); $2.40(mf OTS).

The method of calculation of critical masses of oxides and fluorides of U is given. The geometry assumed is a sphere and the calculations hold only in the absence of hydrogenous materials. Calculations are carried out which are applicable to materials containing from 20 to 100% U^{235}. (T.R.H.)

2771 HW-32347

Hanford Atomic Products Operation, Richland, Wash.

TEMPERATURE CALCULATIONS TO FACILITATE THE DESIGN OF URANIUM SPECIMENS FOR MTR EXPOSURE. S. R. Fields. July 7, 1954. Decl. Feb. 20, 1956. 11p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

2772 WAPD-110

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

VAN DE GRAAFF RADIOGRAPHY OF HIGH URANIUM ALLOYS. R. E. Droegkamp. Sept. 27, 1954. Changed from OFFICIAL USE ONLY July 18, 1956. 24p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

The Van de Graaff radiography of induction-melted U-base ingots other U-base alloys and other high density objects is discussed. The data presented show that Hf sections $\frac{5}{8}$-in. thick, U-base ingots up to 2 in. diameter, and a 4-in. thick forging of Zircaloy-2 were successfully radiographed using exposure times of the order of 1 min. at 2 Mev and less than 250 μa with good definition and latitude and a sensitivity of about 2%. The radiographic quality is not as good as can be obtained on low-density materials with x-ray machines which operate at lower voltages than the Van de Graaff. Methods are discussed involving the use of projection methods, shielding of the gold target and decreasing the size of the focal spot on the target, whereby the radiographic quality might be improved. (auth)